

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES

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October 12, 2005

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Mr. Kevin McGrew
St. Louis Development Corporation
1015 Locust St., Suite #1200
St. Louis, MO 63101

Re: Brownfields Phase II Environmental Site Assessment for the St. Louis Ordnance Plant
(SLOP) Ex-Army Underground Firing Range

Dear Mr. McGrew:

Enclosed, please find a copy of the report for the environmental investigation of the SLOP Ex-Army Underground Firing Range (Former ATCOM Parcel) Site, conducted by the Missouri Department of Natural Resources' Hazardous Waste Program (HWP), Federal Facilities Section (FFS). The investigation was completed under Brownfields funding provided by the U.S. Environmental Protection Agency (EPA) in order to stimulate the redevelopment of idle properties. The Phase II Environmental Site Assessment (ESA) was initiated to further evaluate the recognized environmental conditions identified at the site for the purpose of providing sufficient information regarding the nature and extent of contamination to assist in making informed business decisions about the property, including demolition and removal of existing structures.

The Phase II ESA was conducted with the assistance of the department's Environmental Services Program (ESP) on March 7 and 8, 2005, under the supervision of a FFS environmental engineer. The findings and recommendations of the investigation are presented in the report. If you have any questions or would like further information, please contact me at (573) 751-3107, or Larry Erickson at (573) 751-3907.

Sincerely,

HAZARDOUS WASTE PROGRAM

Shawn Muenks

Shawn Muenks, Environmental Engineer
Federal Facilities Section

SM:dd

Enclosures



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**Phase II
Brownfields
Environmental Site Assessment**

**St. Louis Ordnance Plant Ex-Army Underground Firing Range
Parcel ID #43500000910
St. Louis, Missouri**

July 7, 2005

Prepared For:

**St. Louis Development Corporation
Land Reutilization Authority**

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OCT 14 2005

SUPERFUND DIVISION

Prepared By:

**Missouri Department of Natural Resources
Air and Land Protection Division
Hazardous Waste Program
Federal Facilities Section**

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1.0 EXECUTIVE SUMMARY

On March 7 and 8, 2005, the Missouri Department of Natural Resources (the department), Air and Land Protection Division (ALPD), Hazardous Waste Program's (HWP), Federal Facilities Section (FFS) conducted a Phase II Environmental Site Assessment (ESA) of the St. Louis Ordnance Plant (SLOP) Ex-Army Underground Firing Range, Parcel ID #43500000910. The assessment was conducted to obtain information about possible contaminants on the site and to facilitate informed business decisions that will lead to the redevelopment of the property.

To achieve the objective, the FFS requested the services of the HWP's Environmental Services Program (ESP) personnel to perform the sampling. The FFS Project Manager (PM) conducted research into the history of the site as well as previous assessments. Two site reconnaissance visits were conducted in order to gain information on site accessibility and layout. This report details the findings of the Phase II ESA. This Phase II ESA was conducted pursuant to the process described in ASTM (American Society for Testing and Materials) E 1903-00 *Standard Guide for Environmental Assessments: Phase II Environmental Site Assessment Process*.

Contaminants of concern at the site included lead paint, asbestos, heavy metals, explosives, and pesticides. Previous investigations revealed a presence of lead-based paint, asbestos and lead in the soil. The results of this investigation were used to confirm previous findings as well as investigate all contaminants associated with historical uses of the site.

The results of this contamination assessment indicate that there are hazardous substances present on the site that pose a threat to human health and the environment. These include lead-based paint within the building, asbestos within the building and tunnels, and chlordane in the soil surrounding the building foundation. There is also a possible release of lead into the soil beneath the tunnels and residues of heavy metals on surfaces within the tunnels. These substances will require attention during the redevelopment of the site. The recommendations given at the end of this report give suggested steps that can be taken to remediate the site for future use.

Since the property is located in a predominantly industrial community and is zoned "industrial," cleanup levels were chosen for "industrial" land use within the Cleanup Levels for Missouri (CALM) document. At the time of the writing of this report, draft guidance was being finalized to replace CALM. Missouri Risk-Based Corrective Action (MRBCA) Technical Guidance will be the governing document for cleanup levels within the near future. Therefore, the CALM document will be used until MRBCA is finalized.

2.0 INTRODUCTION

2.1 Purpose

The purpose of this Phase II ESA was to further evaluate the recognized environmental conditions identified at the site for the purpose of providing sufficient information regarding the nature and extent of contamination to assist in making informed business decisions about the property.

2.2 Special Terms and Conditions

This Phase II ESA was conducted pursuant to the process described in the ASTM's E 1903-00 *Standard Guide for Environmental Assessments: Phase II Environmental Site Assessment Process*. This process covers a framework for employing good commercial and customary practices in conducting a Phase II ESA of a parcel of commercial property with respect to the potential presence of a range of contaminants which are within the scope of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as well as petroleum products. This Phase II ESA is intended to provide practical procedural guidance for the continuation of an assessment conducted in accordance with ASTM E 1527-00 *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process* or ASTM E 1528-00 *Standard Practice for Environmental Site Assessments: Transaction Screen Process*.

The FFS was granted permission by Mr. Otis Williams of the Land Reutilization Authority of the City of St. Louis to access the site and perform an intrusive site investigation by an access consent form dated January 11, 2005. The investigation also included two site visits on December 16, 2004, and January 26, 2005.

This report does not act as a regulating document for the remediation of the contaminants associated with the site. The recommendations given at the end of this report only serve as a guideline to prepare the site for future use under the conditions stated within.

2.3 Limitations and Exceptions of Assessment

This Phase II ESA serves as a continuation of a Brownfields Targeted Assessment (BTA) Report dated September 1999, by Ecology and Environment, Inc. This report was used in lieu of an ASTM Phase I ESA. In addition, results from the BTA indicated that petroleum contamination was not a concern at this site. Therefore, this Phase II ESA did not include an evaluation for petroleum products.

The contamination levels found in this ESA will be compared to the department's current CALM document for industrial land use. Once finalized, the MRBCA Technical Guidance should be used for evaluating cleanup levels.

2.4 Limiting Conditions and Methodology Used

One of the limiting conditions encountered at this site was an overgrowth of dense vegetation. This condition dictated sampling locations on the property as well as a time frame for which sampling would take place, e.g. during the winter months when foliage was absent. A second limiting condition was the poor condition of building structures. Areas that were unsafe or blocked by debris were avoided due to safety reasons.

The methodology used for the site evaluation consisted of sampling for contaminants associated with a military small arms weapons range. The contaminants of concern included: total metals, lead-based paint, asbestos containing materials (ACM), explosives, solvents, and pesticides. Sampling for these contaminants was accomplished by investigating various media found at the site. These included direct push and grab soil samples, paint grab samples, ACM grab samples, and wipe samples. Sampling was conducted across the entire site including inside buildings, bunkers, and firing tunnels. The particulars of the sampling event are discussed in further detail in Section 4.2 **Field Explorations and Methods**.

3.0 BACKGROUND

3.1 Site Description and Physical Features

The St. Louis Ordnance Plant Ex-Army Underground Firing Range, also known as the Former ATCOM (U.S. Army Aviation and Troop Command) Parcel, is located at 5701 Lincoln Way (formerly Elward Avenue), Parcel ID #43500000910, St. Louis, Missouri. The site is located south of Edelle Ave., east of Goodfellow Blvd., and north of Lincoln Way, and occupies the east half of the city block. The property contains approximately 3.5 acres of land. The site consists of a fenced area containing a dilapidated one-story wood frame building with basement. Other structures on the site include a 40' x 35' x 12' high concrete bunker with no roof, underground firing tunnels with access stairwells and ventilation to the outside, and a paved driveway that runs the length of the southern portion of the site with spurs leading up to the east and west sides of the main building. There also appears to have been a parking lot west of the building and northeast of the bunker, but it is now in poor condition and overgrown with vegetation. A concrete retaining wall is located at the north end of the parking lot near the northwest corner of the building just south of the tunnels and runs parallel with them for about 20 feet. A small stairway is located at the end of the retaining wall and leads up to the top of the buried tunnels where the elevators are located. Various stairwells are located along the length of the tunnels, allowing access down into them.

The underground tunnels can be accessed from the main floor of the building at the northwest corner and run along the northwest "leg" of the property (See Appendix B, Figure 2, Site Plan and Exploration Location Map). Some of the tunnels can be accessed by stairwells at the northwest corner of the property and have ventilation shafts that exit to the ground surface. Two tall "elevators" are located at the end of the tunnels and are assumed to have been used for removing lead shot from the bullet traps. One of the

elevators has fallen over; revealing a suspended chain with metal scoops attached to it (See Appendix G, Photographs, Picture #15).

The main building consists mainly of office space with a small kitchen, lunchrooms, locker rooms, a small photo lab, and a small basement located at the northeast corner. The stairs leading from the main floor to the basement had collapsed but the basement is also accessible from the outside. The basement consisted of two rooms, a combination locker room/lavatory and a mechanical room. The mechanical room housed piping, breaker boxes, and a large hot water storage tank. The building also had a small attic that is inaccessible due to degradation of the stairs. There is a loading dock on the east side of the building. The northeast corner of the site is vacant.

3.2 Site History and Land Use

The property was part of the St. Louis Ordnance Plant (SLOP), which was a 300-acre area purchased by the Department of Defense from General Electric in 1941. The facility was completed in 1942 and was a Government Owned-Contractor Operated (GOCO) plant. SLOP was divided into several plant areas, which were run by different contractors. Plants 1 and 2, which included the Former ATCOM Parcel, were operated by the U.S. Cartridge Company and produced small arms ammunition (.30 and .50 caliber). The plant operated through World War II but was not reactivated for the Korean and Vietnam Wars. Parts of SLOP were surplused in the mid 1960's, which was when the Former ATCOM Parcel was transferred to a private individual. It remained privately owned until the St. Louis Development Corporation (SLDC) Land Reutilization Authority (LRA) acquired it through a tax foreclosure in 1997. Historic maps of SLOP indicate the property was used in conjunction with the current Army Reserve Center as the Ordnance Proof House, but no information has been found to specifically verify what the property was used for by the military.

According to Geo St. Louis, the parcel is zoned "J" Industrial District. Possible future land use includes incorporating the property into the surrounding industrial community.

3.3 Adjacent Property Land Use

Currently, the property is located in a predominantly industrial area. U.S. General Services Administration (GSA) owns the property to the north of the site across Edelle Avenue. The property directly west and adjacent to the site is the Army Reserve Center. Lincoln Pentair Corporation owns industrial property to the south and east. A small lot at the very northwest corner of the property (end of the longest tunnels) is home to a communications tower.

Previously, according to the 1920 Sanborn™ Map, properties to the south included the Lincoln Steel and Forge, Co., St. Louis Metal Wire, Co., to the southeast was the Wrought Iron Range Co., and to the east was the Pickrel Walnut Co. The 1931 Sanborn™ Map shows the St. Louis Metal Wire Co. became the Niedringhaus Inc. & St. Louis Steel Package Co. The 1951 Sanborn™ Map shows Niedringhaus had taken over

the Lincoln Steel and Forge Co. and Pickrel Walnut became part of SLOP. (Information obtained from Sanborn™ Maps within the BTA report).

3.4 Summary of Previous Assessments

The Ecology and Environment, Inc. (E&E), Superfund Technical Assessment and Response Team (START) was tasked by the U.S. Environmental Protection Agency (EPA) Region 7 Site Assessment and Cost Recovery (SACR) program to conduct a Brownfields Targeted Assessment (BTA) of the Former ATCOM Parcel in April 1999. The team performed a site reconnaissance during the week of April 12, 1999, and field sampling in late June 1999. The sampling consisted of surface and subsurface soils as well as suspected asbestos containing materials and paint sampling. The soils were tested for volatile organic compounds (VOCs), explosives and total metals. The paint was sampled to determine lead levels.

Analytical results of the investigation indicated that hazardous substances were present at the site. Material sampled from the test tunnels and adjoining areas contained asbestos. The paint was found to contain high levels of lead. Lead was also found in one subsurface soil sample above the Soil Target Concentration (STARC) level established in the Cleanup Levels for Missouri (CALM) Document. No VOCs or explosives were detected in any of the soil samples collected.

4.0 PHASE II ACTIVITIES

4.1 Scope of Assessment

The scope of the Phase II ESA is to conduct a physical sampling of the site with respect to the potential presence of a range of contaminants. The Phase II ESA will define what contaminants exist, the range of migration, and give recommendations for closure activities where and if constituent concentration is above regulated levels considering future site use. Concentrations will be compared to the current CALM guidance levels for "industrial" land use. Once finalized, the MRBCA Technical Guidance should be used. This ESA will evaluate a parcel of property with recognized environmental conditions, as defined by the ASTM Standard.

4.1.1 Supplemental Record Review

In addition to previous assessment review, an investigation into previous ownership was conducted. A title search showed that the Department of Defense (DOD) purchased the site from General Electric in 1941. On May 4, 1966, the property was transferred to Arthur and Goldie Goldstein by the United States of America, acting by and through the Attorney General of General Services. On November 29, 1979, the property was transferred to Arthur Goldstein. On January 10, 1985, the property was transferred to George Goldstein. On January 16, 1997, the St. Louis LRA acquired the property through tax foreclosure.

Information about the property was also attained through government maps of the SLOP area and aerial photographs.

4.1.2 Conceptual Site Model and Sampling Plan

A conceptual site model was prepared prior to sampling activities to serve as a guide during field operations. The original model consisted of 5 soil borings located at various locations on the property. The soil borings were to be performed using a track-mounted Geoprobe. The borings were to be advanced to 4 feet below ground surface (BGS) and a continuous sample retrieved for screening. Contaminants of concern included heavy metals and pesticides. The sample was screened for metals with an X-ray Fluorescence (XRF) screening tool and biased samples within the interval were collected for laboratory analyses. In addition to the borings, 2 surface soil grab samples were planned within the concrete bunker for explosives and metals.

Additionally, grab samples were to be collected within the building from suspected ACM. These would include mastic, acoustical tile, pipe wrap, and sprayed on material. A total of 10 to 12 ACM samples were planned. Samples of interior paint were to be analyzed for lead. The XRF was to be used to screen the paint samples for lead content. A total of 5 to 7 grab samples for lead paint was planned. It was anticipated that approximately 25 percent of media screened in the field would be submitted for confirmatory analyses.

Finally, wipe samples were to be used to test for metals and explosives. 25 to 30 wipe samples were planned within the firing tunnels for metals. The wipes near the firing points would also be tested for explosive residues including Pentaerythritol Tetranitrate (PETN), an ingredient used in armor piercing rounds. Wipes at the impact points would also be analyzed for phosphorus, magnesium, perchlorates, and Polychlorinated Biphenyls (PCBs) as well as metals associated with small arms ammunition testing. Two wipes would be taken inside the vault in the concrete bunker and analyzed for metals and explosives. A copy of the Sampling Plan can be found in Appendix D.

Sampling for VOCs was not conducted since none were detected in the BTA. Groundwater sampling was also excluded due to the nature of recognized environmental concerns and the assumption that the area is supplied by municipal water supplies.

4.1.3 Chemical Testing Plan

Analysis was conducted for asbestos in the interior grab samples and for lead in the paint samples. Analysis for total metals and explosives was conducted within the concrete bunker and at the firing point. EPA method 8330 was used to analyze for explosives. This method was modified to include PETN. Total metals analyses included antimony, arsenic, beryllium, cadmium, copper, lead, mercury, nickel, selenium, thallium, and zinc. In addition to total metal analyses, soil sample analysis included Toxicity Characteristic Leachate Procedure (TCLP) analysis if any soil sample's total analyte results were 80% of twenty times the TCLP regulatory limit. Wipe samples collected at the firing points

were also tested for nitroaromatics, in addition to the above metals. Magnesium, phosphorus, perchlorate and PCBs were included at the impact points. (See Appendix D: Sampling Plan).

4.1.4 Deviations from the Work Plan

During field sampling activities, changes to the work plan were made to fit site conditions. All changes were approved by the FFS Project Manager. One of these changes included advancing borings B1 and B5, located at the end of two firing tunnels, to a total depth of 12 feet BGS. Observations made of the interior of the firing tunnels showed the depth to the floor of the tunnel to be approximately 12 feet. Thus, in order to obtain samples near the bottom of the tunnels, the borings were advanced to 12 feet and a continuous core was collected for screening and laboratory sample collection. Of the 5 borings, one was relocated in the field. Boring B1 was moved from north of the concrete bunker, west to the end of a firing tunnel.

Changes to the laboratory analysis included the elimination of testing for PETN. After sample collection it was discovered that the laboratory responsible for sample analyses was not equipped to test for PETN. A search was made for a laboratory with the capability to perform this test. None were found; therefore PETN analysis was abandoned.

Finally, a complete investigation into the building layout and exact configuration of the tunnels was not performed due to time constraints and safety concerns. Estimates of the quantity of lead paint and ACM will not be provided in this report. Confirmation of which materials are classified as hazardous are given for future demolition considerations.

4.2 Field Explorations and Methods

4.2.1 Grab Samples

The following grab samples were obtained on the day of sampling. All references to site conditions depict situations at the specific locations and time of sampling. Conditions may change with time and proximity.

4.2.1.1 Paint

Interior painted surfaces of the main building were screened for lead content with a Niton XL700 multi-element XRF analyzer. The XRF readings were recorded and confirmatory samples were collected for data verification. The building was divided into three main areas and numerous XRF readings were taken within each of these areas. Two laboratory samples were collected from each area for a total of six samples. It was noted that the interior paint of the building was a bright green color and appeared to be applied in a thick coat that was peeling away in many places (See Appendix G, Photographs, Picture #3).

4.2.1.2 Asbestos Containing Material (ACM)

Grab samples for asbestos were collected from various materials within the building and firing tunnels. Samples were collected from mastic in the main hallway, ceiling tile from the offices, floor tile from the firing station hallway, pipe wrap in the basement, and sprayed on material within the tunnels. The sprayed on material within the tunnels was several inches thick and very friable (See Appendix G, Photographs, Picture #11). Pipe wrap was in very poor condition and falling from the pipes in most places. The overall condition of the building is very poor with numerous exposure routes from inside the building to the outside environment.

4.2.1.3 Surface Soil

Two surface soil grabs were collected inside the concrete bunker, one near the door to the vault and one east of the vault to be analyzed for explosives and total metals (See Appendix G, Photographs, Picture #21). A surface soil sample was also collected south of the loading dock, along the building foundation to be analyzed for pesticides (See Appendix G, Photographs, Picture #22). A summary of the surface soil samples is given in Table 2 in Appendix A.

4.2.2 Soil Borings

The first boring was located north of the loading dock from 0 to 4 feet in depth (boring B3, Picture #18 of Appendix G). The next boring was located within a clearing at the southeast corner of the property from 0 to 4 feet in depth (boring B4, Picture #19 of Appendix G). Sampling continued on the west side of building near the entrance to the concrete bunker from 0 to 4 feet in depth (boring B2, Picture #17 of Appendix G). The Geoprobe was driven up the cleared path to the elevator towers. Here two borings were chosen at the southwest corners of two of the bullet traps. The first one was near the southwest corner of the property near end of tunnel named 'T1' from 0 to 12 feet in depth in 4 foot intervals (boring B5, Picture #20 of Appendix G). The last subsurface boring was taken at the end of tunnel named 'T2' from 0 to 12 feet in depth in 4 foot intervals (boring B1, Picture #16 of Appendix G). A summary of the borings is given in Table 2 in Appendix A.

4.2.3 Wipe Samples

Wipe samples were collected from a metal shelf within the vault inside the concrete bunker. Vault-wipe samples were analyzed for total metals and explosives residues.

Wipe samples were also collected from within the firing tunnels. The first area sampled was the firing point (See Appendix G, Photographs, Picture #10). Three of the longer tunnels were chosen for sample collection of the firing point. There are a total of 4 long tunnels, designated in the field as 'T1' through 'T3' starting from the south and skipping the third tunnel up. The northernmost tunnel, T3, was the longest of the four (it was later found that the tunnels were numbered by the military starting at the north and going

south; therefore, T1 = #4, T2 = #3, skipped = #2, and T3 = #1). Firing points sample analyses included total metals and explosives residues.

Visual observations of the tunnels revealed that they were cylindrical in shape and appeared to be constructed of pre-cast concrete sewer pipe segments. The average diameter of the tunnels was approximately 6 feet.

Wipe samples were also collected at the impact points. Wipe samples were taken at the back of the large metal bin (bullet trap) at the end of the "skipped" tunnel (See Appendix G, Photographs, Picture #12). Wipe samples were also collected on the exhaust vent of tunnel T2 and impact point of T1. Wipes were also taken from the rear door of a metal "box" located midway down tunnel T3 (longest tunnel). It is thought that this metal box (4'x4'x6'high) was used as some sort of trajectory observation using high speed film or a place to hang a piece of metal for armor piercing tests. The end of tunnel T3 was not explored. It was also noted that tunnels T1 and T2 contained two metal triangular structures thought to be used to test bullet velocity. Wipes at the impact points were analyzed for total metals, magnesium, phosphorus, perchlorates, and PCBs.

Wipe samples from the discharge chute inside one of the testing vaults were also collected. These testing vaults consisted of concrete room (approximately 20' x 30') with large steel locking doors. Inside each vault were two short metal tubes, approximately 12 feet in length connected directly to the firing point. The end of the tube was capped with a thick piece of steel. A narrow opening below the end of the tube allowed spent rounds to fall into metal hoppers with wire screens in them to catch the bullets. There was what appeared to be a large water pump located on the floor at the end of each tube. There appeared to be a total of six testing vaults.

4.3 Sampling and Chemical Analyses and Methods

Field sampling was conducted by ESP personnel under the supervision of a FFS Project Manager. A summary of the field sampling methods and chemical analyses can be found in the Phase II Environmental Site Assessment Sampling Report in Appendix E.

4.3.1 Paint

Paint samples were collected from locations where the XRF gave the highest readings for lead in each of the three areas. Six samples were collected by peeling the paint from the surface and placing it in sealed plastic bags for transport to the laboratory. Samples were numbered 0502615 through 0502620. Analysis of lead content was performed in the laboratory according to method SW 846 6010B (ICP). The sample was diluted during analysis and results reported in dry weight.

4.3.2 ACM

Asbestos samples were collected from solid materials within the building and tunnels. Eight samples were collected, wetted with deionized water, and placed in sealed plastic

bags for transport to the laboratory. Samples were numbered 0502621 through 0502628. The samples were sent to a contract laboratory for analyses. Table 1 in Appendix A summarizes the type of samples collected and their locations within the structures.

4.3.3 Soil

Surface soil aliquots were collected with a stainless steel spoon and placed in a clean aluminum pan. The aliquots were homogenized and representative samples were collected, placed in sealed glass jars, labeled, and stored at 4 degrees Celsius (°C) for transport to the laboratory. Soils were analyzed for heavy metals, explosives, and pesticides. Method SW 846 6010B (ICP) was used for antimony, arsenic, beryllium, cadmium, copper, lead, nickel, selenium, thallium and zinc; mercury was analyzed by method EPA 245.1; explosives by method 8330; and pesticides by method 8081A.

Depth-discreet soil samples were collected using a track-mounted hydraulic soil probe. Clean disposable acetate liners were inserted into stainless steel macro core samplers fitted with clean cutting shoes. The core samplers were advanced to the desired sampling depth via drive rods and the soil filled samplers retrieved for sample collection. Soil intervals within the borings were screened with the XRF. The XRF readings did not show any detectable levels of metals within any of the borings. Composite samples were collected from each 4 feet interval, placed in sealed glass jars, labeled, and stored at 4°C for transport to the laboratory. A summary of the sample numbers, locations, depth, and parameters tested for is given in Table 2 in Appendix A.

The locations of the soil borings and surface soil grabs were recorded with a handheld global positioning system (GPS). The GPS locations are listed below.

Borings:

B1 (SW corner of T2 bullet trap) –	N 38E 41' 18.5"	W -90E 16' 6.4"
B2 (near entrance to bunker) –	N 38E 41' 17.0"	W -90E 16' 5.9"
B3 (near loading dock) –	N 38E 41' 16.3"	W -90E 16' 4.1"
B4 (SE corner of property) –	N 38E 41' 15.5"	W -90E 16' 3.4"
B5 (SW corner of T1 bullet trap) –	N 38E 41' 18.7"	W -90E 16' 7.1"

Surface Grabs:

Pesticide sample near building foundation, South of loading dock –	N 38E 41' 16.1"	W -90E 16' 4.0"
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Explosives sample, near vault door –	N 38E 41' 17.2"	W -90E 16' 6.2"
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4.3.4 Structure Surfaces

Surfaces within the tunnels and concrete bunker were analyzed for residues associated with the testing of small arms ammunition. The surfaces were swabbed with a sterile

gauze pad soaked with an appropriate solvent for the contaminant of concern. Acetone was used for explosives wipes while deionized water was used for metals wipes. Once the gauze was soaked with the appropriate solvent, an area 10 cm x 10 cm (100 cm²) was swabbed across the entire area and again at a 90° angle to ensure complete coverage. The wipe was then placed in a sealed glass jar, labeled and stored at 4°C for transport back to the laboratory. A summary of the wipe samples collected with locations and parameters tested for is given in Table 3 in Appendix A.

All sample analyses were performed in accordance with procedures approved or recognized by the U.S. EPA.

5.0 EVALUATION AND PRESENTATION OF RESULTS

5.1 Surface and Subsurface Conditions

The following is a summary of surface and subsurface conditions as they existed at the time of sampling. Again, all references to site conditions depict situations at the specific locations and times. Conditions may change with time and proximity. The Geologic Setting section was obtained from a report supplied by the Geological Survey and Resource Assessment Division (GSRAD) which can be found in Appendix C.

5.1.1 Physical Conditions

The site is rectangular in shape with a long narrow portion extending to the northwest. This is the location of the underground tunnels. The site slopes from the northwest to the southeast with surface runoff in the same direction. Surface drainage flows southeast to storm water drains along Lincoln Way to the south and a side street to the east. The slope of the site is thought to be the result of construction of the underground tunnels. The tunnels begin at the northwest corner at the first floor elevation of the building and extend parallel with the north boundary of the site. It appears that earthen fill was used to bury the concrete tunnels resulting in an elevated ridge above the tunnels. The change in elevation across the site is approximately ten feet. The site is covered with heavy vegetation making travel across the site almost impossible.

5.1.2 Geologic Setting (Reference #4)

5.1.2.1 Site Location and Physiographic Setting

The SLOP site is located on low rolling hills and a broad valley surrounded by residential and industrial property in northwest St. Louis City, Missouri. The Underground Firing Range site is located in U.S. Survey #1913 Township 46 North, Range 7 East. Approximate coordinates for the site are 38° 41' 16.8" north latitude and 90° 16' 3.7" west longitude.

The SLOP site lies in the southeast portion of the Dissected Till Plains sub-province of the Central Lowlands physiographic province in Missouri, which is characterized by mixed smooth plains and rolling hills developed on glacial material deposits.

5.1.2.2 Stratigraphic Units

Pennsylvanian-age shale and sandstone comprise the Western Interior Plains Confining Unit beneath the site. Below this confining unit lie Mississippian-age limestones of the Springfield Plateau Aquifer and Ozark Confining Unit, which includes the Chouteau Group.

Residuum and Soil: The soil beneath the SLOP site is Urban-Harvester silty clay loam that is composed of roughly eighteen to thirty-five percent clay. The silty clay residuum and soil thickness varies greatly due to anthropogenic alteration, however it may be up to 40 feet thick beneath the site.

Pennsylvanian-Age Shale and Sandstone: The Pennsylvanian-age rocks beneath the site are divided into the Marmaton and Cherokee Groups. The bottom of the Marmaton Group is exposed at the surface in a few locations surrounding the site. The Marmaton Group locally consists of shale (5 to 35 feet thick). The Cherokee Group is locally composed of sandstone (30 to 100 feet thick). The Pennsylvanian-age rocks beneath the site extend from near surface to roughly 120 feet below ground surface.

Mississippian-Age Limestone: The Mississippian-age rocks beneath the site are divided into the Ste. Genevieve and St. Louis Limestones, Salem and Warsaw Formations, Burlington-Keokuk Limestone and Fern Glen Formation. Locally, these formations consist of limestone, cherty limestone, and argillaceous limestone units. The Mississippian-age rocks beneath the site extend from roughly 120 feet below the ground surface to approximately 720 feet below ground surface.

Chouteau Group: The Chouteau Group is locally characterized by fine- to medium-crystalline limestone grading to dolomite with shale partings in the upper parts. The strata is about 50 feet thick locally.

Stratigraphic unit descriptions are based on logged mineral test wells located within a 3-mile radius of the site. Table 1 of the Geologic Report (Appendix C) lists the geohydrologic properties (thickness, lithology, nature of porosity and permeability, hydraulic conductivity, and hydrologic unit) of the strata beneath the site.

5.1.2.3 Structural Features

There are no known structural features within 4 miles of the site that would influence groundwater flow.

5.1.3 Hydrogeologic Conditions

5.1.3.1 Aquifers/Wells

The Urban-Harvester residuum soils are slightly acidic to neutral (pH 5.6 to 7.3) and permeability is moderate (0.2 to 2.0 inches per hour). The hydraulic conductivity is roughly 1.4×10^{-3} to 1.4×10^{-4} centimeters per second (cm/s).

The Western Interior Plains Confining System lies within the Pennsylvanian-age sandstone. Even though the Western Interior Plains Confining System is defined as an aquitard as a unit, there are several (up to 30 feet thick) water bearing members interspersed throughout the system. The hydraulic conductivity of the Western Interior Plains Confining System ranges from 3.0×10^{-6} to 6.1×10^{-7} cm/s.

The stratigraphic units of the Springfield Plateau Aquifer lie immediately below the Pennsylvanian-age sandstone and should be considered in hydraulic interconnection from the top to the base of the aquifer. The hydraulic conductivity of the Springfield Plateau Aquifer is roughly 7.8×10^{-3} cm/sec.

Regionally, the Ozark Confining Unit is an effective barrier to downward groundwater movement. However, in this area it is unclear if this unit is present as an effective aquitard. The Chouteau Group may have hydraulic conductivity as high as 1×10^{-5} cm/sec.

GSRAD files contain no record of current groundwater use locally. However, no laws preclude groundwater use in the future. Since there are records of abandoned wells within 4 miles of the site, it may be possible that some previously used wells were not properly plugged. This may have led to contaminant conduits through the overlying Western Interior Plains Confining Unit. Therefore, the Springfield Plateau Aquifer was included in this report.

The GSRAD databases contain no records of wells within a 4-mile radius of the SLOP site. All residences and industries within 4 miles of the site are serviced by municipal water supplies.

5.1.3.2 Groundwater Flow Direction

On average, groundwater flow direction within the residuum is toward the east and southeast, due to the topographic control. The Western Interior Plains Confining System groundwater flow has not been established locally due to the Mississippi River (a major discharge setting), groundwater within the strata may flow toward the east. The Springfield Plateau Aquifer groundwater flow direction has not been established locally; however, regional flow is likely toward the east due to the base level of the Mississippi River.

5.1.3.3 Surface Water Pathway

Most surface water leaving the site enters storm water drains. However, surface water leaving the St. Louis Ordnance Plant site that does not enter the storm water conduits flows roughly 2.4 miles east along drainage ditches until reaching the Mississippi River. Average flow volume of the Mississippi River at St. Louis City is approximately 186,100 cubic feet per second.

The site lies within a 100-year floodplain. The surface water runoff area on and up gradient from the site is greater than 500 acres. The 2-year, 24-hour rainfall is approximately 3.5 inches.

5.1.4 Verification of Conceptual Site Model

Exploration of the site during sampling activities and analysis of data revealed that the conceptual model was valid. No physical evidence of VOCs was detected at the site during subsurface soil sampling, confirming the findings of the BTA and supporting the option to exclude this parameter from the Phase II ESA. The choice to exclude a groundwater investigation was also confirmed by information supplied by GSRAD in that there is no record of current groundwater use locally, and all residences and industries within 4 miles of the site are serviced by municipal water supplies.

5.2 Analytical Data

5.2.1 Paint

All of the paint samples collected for laboratory analyses tested positive for lead content. Lead was detected at levels ranging from 13,700 to 186,000 mg/kg. This concentration yields a maximum of 18.6% lead by weight. The U.S. Department of Housing and Urban Development defines lead-based paint as anything over 0.5% by weight. A summary of analytical results for paint is summarized in Table 4 in Appendix A.

5.2.2 ACM

Asbestos was detected in 6 out of the 8 samples collected. The pipe wrap on the first floor (Sample 0502621) contains <1% chrysotile and <1% amosite. The pipe wrap in the basement mechanical room (Sample 0502623) contains 40% chrysotile and 2% amosite. The pipe wrap in the basement bathroom (Sample 0502624) contains <1% chrysotile. The transite siding (Sample 0502625) contains 30% chrysotile. The sprayed on material in the tunnels (Sample 0502627) contains 40% chrysotile and <1% amosite. The floor tile (Sample 0502628) contains 5% chrysotile. All of these materials classify as ACM.

No asbestos was found in the acoustical wall tile at the firing stations or in the ceiling tile on the first floor of the building (Samples 0502622 and 0502626).

5.2.3 Soil

Soil samples were analyzed and compared to STARC levels in the CALM document for Scenario C, which is "Industrial" land use requiring institutional controls. The contaminants that exceed the STARC levels included beryllium, lead, and chlordane. Beryllium ranged from 0.380 mg/kg in sample 0502767 to 0.703 mg/kg in sample 0502765. The STARC limit for beryllium is 0.2 mg/kg. A previous survey conducted within the vicinity revealed a background concentration of beryllium at 0.57 mg/kg (See Appendix I, Background Levels).

One subsurface soil lead concentration exceeded the STARC limit of 660 mg/kg for Scenario C, "Industrial" land use. Sample 0502772 contained lead at 1390 mg/kg. The background concentration for lead is 78 mg/kg.

The surface soil sample collected near the building foundation (Sample 0502775) tested for chlordane at 1730 mg/kg which far exceeded the STARC limit for chlordane of 30 mg/kg for Scenario C, "Industrial" land use. Other pesticides were reported at levels above STARC limits, however, the reported values are minimum detection limits and the actual results fell below these reported values. A summary of selected analytical results for soil is given in Table 4 in Appendix A.

5.2.4 Surface Wipes

Analysis of wipe samples collected from the tunnels found elevated levels of metals (copper, iron, lead, magnesium, and zinc) on interior surfaces within the tunnels. The results of the wipes are reported in micrograms per 100 square centimeters ($\text{ug}/100 \text{ cm}^2$). (See Appendix F, Laboratory Results). The lead readings from the wipes ranged from 110,000 $\text{ug}/100 \text{ cm}^2$ to 26,000,000 $\text{ug}/100 \text{ cm}^2$ (Sample 0502783). As a comparison, the highest allowable clearance criterion for lead dust wipe samples within the confines of a building is 800 ug/ft^2 (or 86.1 $\text{ug}/100 \text{ cm}^2$) according to the CALM document, Section 7.2 Lead Abatement, Scenario C, for window wells. The reported values of lead far exceed cleanup levels for surface contamination.

There are no cleanup levels within the CALM document for surface contamination of metals other than lead. However, the highest reported levels of copper, iron, magnesium, and zinc on interior tunnel surfaces indicate elevated levels of these residuals when simulated with the lead levels.

All wipe samples tested below detectable limits for explosives. The highest readings for certain metals in the wipes are given in Table 4 in Appendix A. The results of all wipe samples can be found in the Laboratory Results in Appendix F.

6.0 DISCUSSION OF FINDINGS AND CONCLUSIONS

6.1 Recognized Environmental Conditions

Recognized Environmental Conditions (RECs) identified on the site include:

- Lead-based paint within the building;
- ACM within the building and tunnels;
- Soil contamination from chlordane used as a pesticide around the perimeter of the building;
- Lead contamination of soil at the bottom of the bullet traps; and
- Metal residues (including lead) on the interior surfaces of the underground tunnels.

6.2 Affected Media

The media affected at the site includes interior paint, structural materials, soil, and structure surfaces. Exact amounts of lead paint and ACM within the building was not calculated, however the testing suggests that all green paint contains lead and all pipe wrap, floor tile, and sprayed on material contains asbestos. All soil near the building foundation is considered contaminated with chlordane. Areas of subsurface soil surrounding the base of the tunnels may be contaminated with lead from activities conducted within the tunnels. The interior surfaces of the tunnels contain residues of various metals from the firing of small arms ammunition.

6.3 Evaluation of Media Quality

Lead based paint:

All interior painted surfaces can be assumed to contain high levels of lead. This includes all surfaces that are painted with the green paint. The lead content is high enough for any loose paint to be hazardous to human health.

ACM:

Many materials within the building and tunnels are classified as ACM. These materials include pipe wrap, transite siding, floor tile, and sprayed on material within the tunnels. Due to the poor condition of the structures on the site, these materials are exposed to the elements and should be considered as posing a threat of release to the environment and also a danger to human health of persons that enter the site through direct contact or inhalation.

Soil:

From the results of the sampling and the manner in which it was commonly applied, it can be assumed that the soil surrounding the entire building foundation is contaminated with high levels of chlordane. The lead content of the subsurface soil at a depth near the bottom of bullet trap 'T2' was approximately two times the STARC limit indicating a

possible release from the tunnel into the surrounding soil. Although beryllium was detected above the STARC limit, the concentrations were near the background level, indicating that a release associated with facility activities is improbable.

Tunnel Surfaces:

Elevated levels of metal residue (copper, iron, lead, magnesium, and zinc) were found on the surfaces of the underground tunnels. Evaluation of data results revealed iron and lead levels that appear to be above expected amounts for the area sampled. QC analysis confirmed that the reported levels are accurate. Exposure to these surfaces could be harmful through dermal contact or inhalation.

6.4 Other Concerns

Another concern associated with the site is the risk of physical harm, due to the poor condition of the building and/or the possibility of entrapment within the underground tunnels. During the site visit conducted on January 26, 2005, it was noted that there were several breaches in the chain link fence surrounding the property, in particular on the north and east sides. These were large enough to allow a person to access the property. Consideration should be given to repair these areas in order to prohibit public access to the property.

7.0 RECOMMENDATIONS

After review of site history, previous investigations, site visits, and interpretation of the data presented in this report, the following should be considered prior to the redevelopment of the property.

1. The lead-based paint within the building should be considered as a possible hazardous material during the demolition of the building. To date there are no established cleanup levels for lead in paint set by the state of Missouri or the EPA. Risk based assessment is used to measure hazardous levels and is based on condition of the paint and exposures to certain populations. Consideration should be given to employ proper disposal techniques at the time of demolition. A bulletin outlining the department's requirements for lead paint abatement and the clearance criteria has been provided in Appendix H.
2. ACM within the building is considered a hazardous substance and will require abatement prior to the redevelopment of the site. This includes all materials listed as ACM in this report. Most of the surfaces within the underground tunnels are covered with ACM and will require abatement or a means of keeping the ACM contained during demolition of the tunnels. Since the site is located within the City of St. Louis, it falls under the jurisdiction of the St. Louis Division of Air Pollution Control. The bulletin in Appendix H outlines the department's requirements for asbestos abatement as well as contact information for the local agency that regulates this area.

3. Chlordane contaminated soils surrounding the perimeter of the building footprint will require some over-excavation during demolition activities. It is suggested that overdig be performed when the building foundation is removed and the excavated soil be properly disposed of or treated. Follow up testing should be performed to ensure that all chlordane contaminated soil has been removed.
4. Some lead contamination was found above STARC levels at a depth near the bottom of the bullet trap of tunnel 'T2' (#3). It is suggested that soil beneath the tunnels be tested for lead contamination once the tunnels have been removed to confirm or disprove the presence of a release.
5. There are no regulations governing the amount of metal residues other than lead on interior surfaces. Precautions should be taken during demolition of the tunnels to protect workers from the harmful effects of metal residues through dermal contact or inhalation of disturbed residuals. In addition, the demolition activities should be conducted in order to prevent any residual substances to be released into the environment. This practice should be in conjunction with abatement of the ACM.
6. It should be noted that groundwater testing was not conducted since the property is supplied with municipal water. However, it is suggested that groundwater sampling be performed if domestic wells are planned for this area in the future. This may be accomplished through the installation of groundwater monitoring wells. Otherwise, a restriction should be placed on the property prohibiting the drilling of wells for domestic use.
7. Finally, since the property is zoned "industrial" and located within a predominantly industrial community, cleanup levels were chosen for industrial land use. Any reuse of the property other than industrial will require reevaluation of cleanup standards. The department should be contacted for final recommendations once a reuse of the property has been established.

8.0 REFERENCES AND SOURCES OF INFORMATION

1. Ecology and Environment, Inc. (E&E), Superfund Technical Assessment and Response Team (START). Brownfields Targeted Assessment Report for the Former ATCOM Parcel Site, St. Louis, Missouri. September 1999. 14 pages plus Appendices.
2. Muenks, Shawn, Environmental Engineer, Federal Facilities Section, Hazardous Waste Program. Memorandum. SLOP Ex-Army Underground Firing Range Site Sampling Event conducted on March 7 and 8, 2005. March 10, 2005. 4 pages.
3. Muenks, Shawn, Environmental Engineer, Federal Facilities Section, Hazardous Waste Program. Memorandum. SLOP Ex-Army Underground Firing Range Site Visit conducted on December 16, 2004. December 17, 2004. 2 pages.
4. Bachle, Peter, Geologist, Geological Survey Program, GSRAD. Memorandum. Geohydrologic Summary of St. Louis Ordnance Plant Site. May 20, 2005. 6 pages plus Table.
5. Environmental Services Program. Environmental Site Assessment Sampling Plan. St. Louis Ordnance Plant (SLOP) Ex-Army Underground Firing Range, St. Louis, Missouri, St. Louis City. 10 pages plus Appendices.
6. Environmental Services Program. Phase II Environmental Site Assessment Sampling Report. St. Louis Ordnance Plant (SLOP) Ex-Army Underground Firing Range, St. Louis, Missouri, St. Louis City. 5 pages plus Appendices and Table.
7. American Society for Testing and Materials (ASTM). Designation: E 1903. "Standard Guide for Environmental Site Assessments: Phase II Environmental Site Assessment Process". Reapproved 2002. 14 pages.
8. Missouri Department of Natural Resources, Hazardous Waste Program. Technical Bulletin. Requirement for Asbestos and Lead Paint Abatement. September 2004. 6 pages
9. URS Group, Inc. Site-Specific Environmental Baseline Survey, St. Louis Army Ammunition Plant, St. Louis, Missouri, Section 2.15 Regional Background. May 2004. 1 page plus 3 Tables and Map.
10. Missouri Department of Natural Resources, Division of Environmental Quality, Hazardous Waste Program. Guidance Document. Cleanup Levels for Missouri (CALM). Revised June 29, 2001. 31 pages plus Appendices.

APPENDIX A
TABLES

SLOP Ex-Army Underground Firing Range
St. Louis, Missouri

Table 1: Asbestos Samples		
Sample Number	Sample Material	Sample Location
0502621	Pipe wrap	South end of area A1 (1 st floor)
0502622	Acoustical tile	North end of area B1
0502623	Pipe wrap	Basement – mechanical room
0502624	Pipe wrap	Basement – shower room
0502625	Transite siding	North end of building
0502626	Ceiling tile	Area B1
0502627	Sprayed on material	Tunnels
0502628	Floor tile (mastic)	Firing station corridor

Table 2: Soil Sample Locations and Depth				
Sample No.	Boring No.	Location	Depth	Parameters
0502629	B3	North of loading dock	0-4 ft.	Metals, pesticides
0502765	B4	SE corner of property	0-4 ft.	Metals
0502766	B2	Near entrance to bunker	0-4 ft.	Metals
0502767	B5	SW corner of bullet trap "T1"	0-4 ft.	Metals
0502768	B5	SW corner of bullet trap "T1"	4-8 ft.	Metals
0502769	B5	SW corner of bullet trap "T1"	8-12 ft.	Metals
0502770	B1	SW corner of bullet trap "T2"	0-4 ft.	Metals
0502771	B1	SW corner of bullet trap "T2"	4-8 ft.	Metals
0502772	B1	SW corner of bullet trap "T2"	8-12 ft.	Metals
0502773	Surface	Inside bunker – vault entrance	0-6 in.	Metals, explosives
0502774	Surface	Inside bunker – east of vault	0-6 in.	Metals, explosives
0502775	Surface	South of loading dock near building foundation	0-6 in.	Pesticides

Table 3: Wipe Sample Locations		
Sample Number	Location	Parameters
0502776	Concrete bunker – metal shelf	Metals, explosives
0502777	Firing point, T1	Metals, explosives
0502778	Duplicate of 0502777	Metals, explosives
0502779	Firing point, T2	Metals, explosives
0502780	Firing point, T3	Metals, explosives
0502781	Impact point, skipped tunnel	Metals, magnesium, phosphorus, perchlorate
0502782	Exhaust vent, T2	Metals, magnesium, phosphorus, perchlorate
0502783	Impact point, T1	Metals, magnesium, phosphorus, perchlorate, PCBs
0502784	Discharge chute of metal tube inside short tunnel (vault)	Metals, magnesium, phosphorus, perchlorate
0502785	Metal door of observation box, midway down tunnel T3	Metals, magnesium, phosphorus, perchlorate

Table 4: Summary of Selected Analytical Results

Sample #	Matrix	Parameter	Results	Missouri STARC Scenario C	Background
0502615	Paint	Lead	186000 mg/kg	NA	NA
0502617	Paint	Lead	76200 mg/kg	NA	NA
0502619	Paint	Lead	22400 mg/kg	NA	NA
0502618	Paint	Lead	16600 mg/kg	NA	NA
0502616	Paint	Lead	13700 mg/kg	NA	NA
0502620	Paint	Lead	11500 mg/kg	NA	NA
0502765	Soils	Beryllium	0.703 mg/kg	0.2 mg/kg	0.57 mg/kg
0502770	Soils	Beryllium	0.583 mg/kg	0.2 mg/kg	0.57 mg/kg
0502772	Soils	Beryllium	0.577 mg/kg	0.2 mg/kg	0.57 mg/kg
0502629	Soils	Beryllium	0.535 mg/kg	0.2 mg/kg	0.57 mg/kg
0502771	Soils	Beryllium	0.522 mg/kg	0.2 mg/kg	0.57 mg/kg
0502766	Soils	Beryllium	0.521 mg/kg	0.2 mg/kg	0.57 mg/kg
0502774	Soils	Beryllium	0.480 mg/kg	0.2 mg/kg	0.57 mg/kg
0502773	Soils	Beryllium	0.472 mg/kg	0.2 mg/kg	0.57 mg/kg
0502769	Soils	Beryllium	0.457 mg/kg	0.2 mg/kg	0.57 mg/kg
0502767	Soils	Beryllium	0.380 mg/kg	0.2 mg/kg	0.57 mg/kg
0502772	Soils	Lead	1390 mg/kg	660 mg/kg	78 mg/kg
0502775	Soils	Chlordane	1730 mg/kg	30 mg/kg	NA
0502778	Wipe	Copper	9600 mg/100cm ²	NA	NA
0502777	Wipe	Iron	210000 mg/100cm ²	NA	NA
0502783	Wipe	Lead	26000 mg/100cm ²	NA	NA
0502783	Wipe	Magnesium	1600 mg/100cm ²	NA	NA
0502782	Wipe	Zinc	9400 mg/100cm ²	NA	NA

APPENDIX B
FIGURES

SLOP Ex-Army Underground Firing Range
St. Louis, Missouri

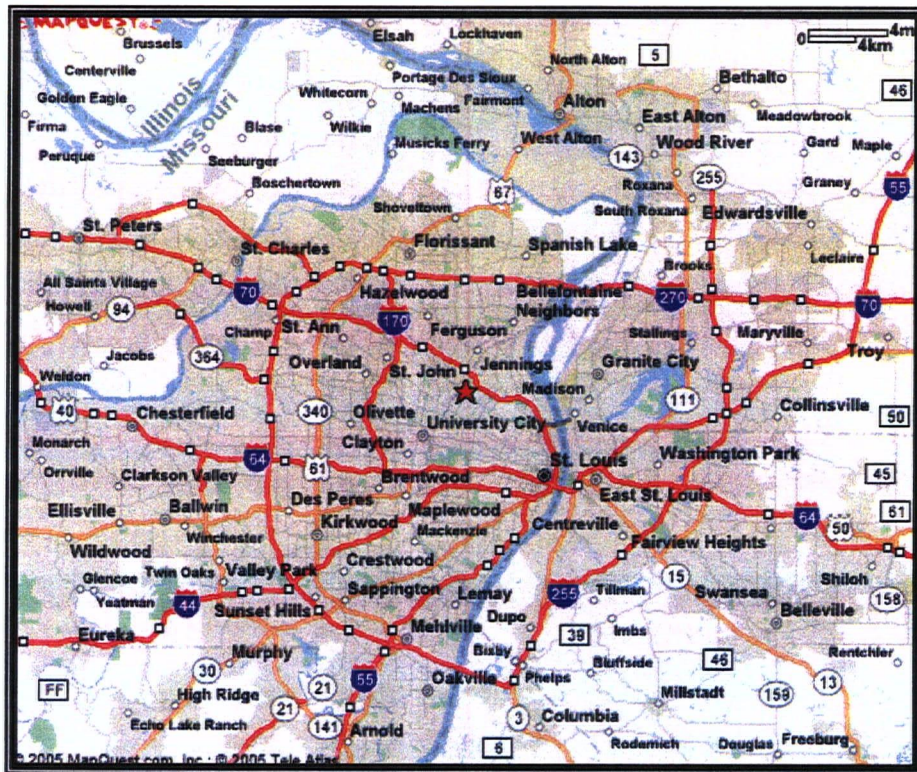


Figure 1A: Site Location Map (St. Louis City Area)

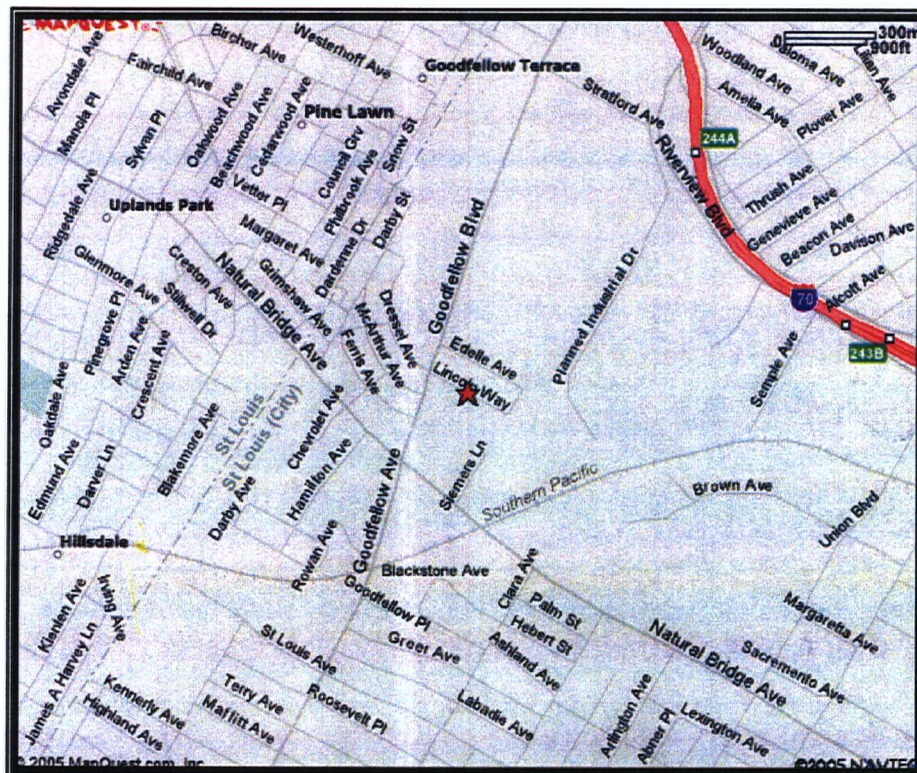
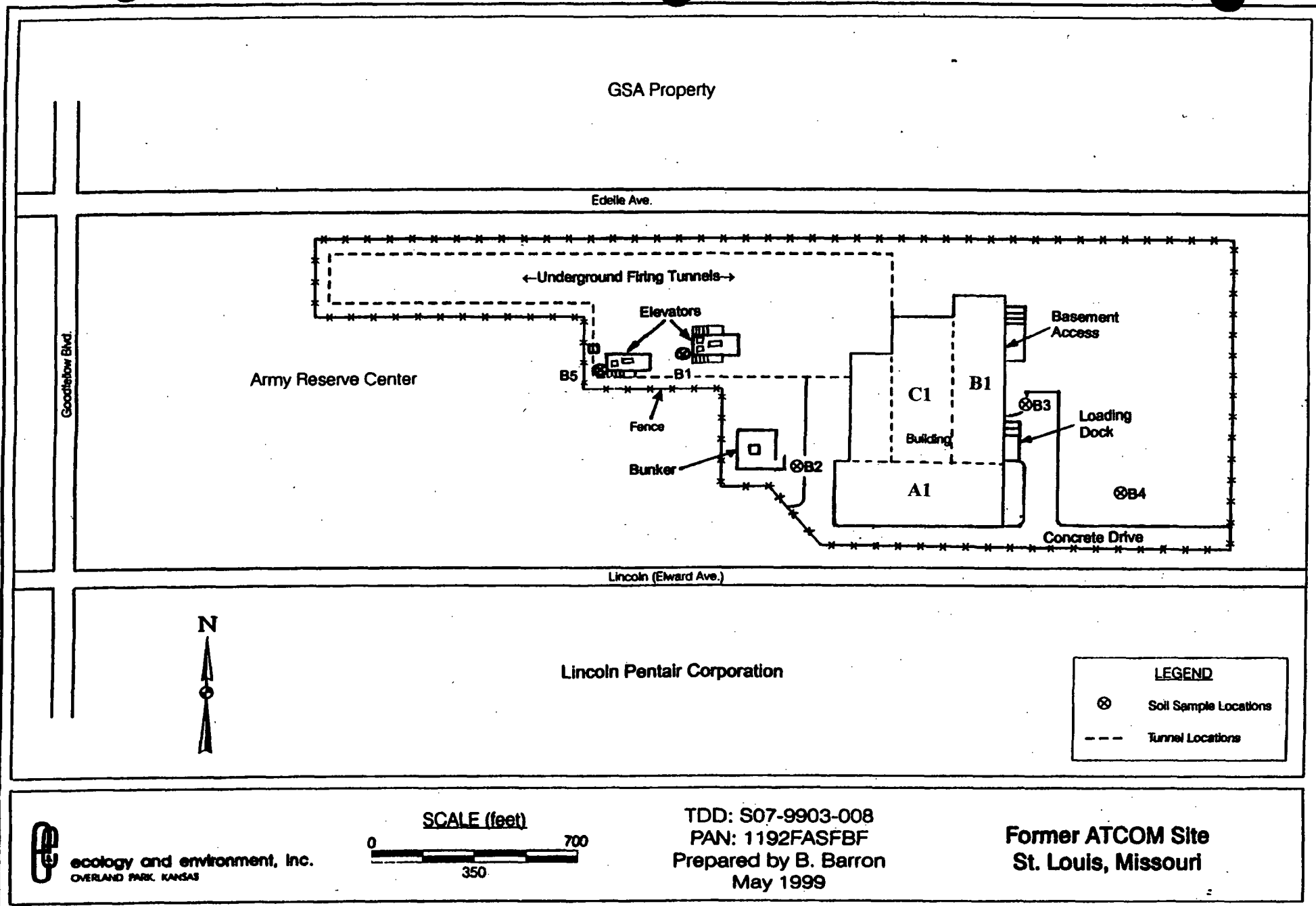


Figure 1B: Site Location Map (Street Location)
(Maps obtained from MapQuest.com, Inc.)



FASFG3 CDR

Figure 2: Site Plan and Exploration Location Map
Modified by S. Muenks - May 2005

Source: STM Field Notes

APPENDIX C
GEOLOGIC REPORT

SLOP Ex-Army Underground Firing Range
St. Louis, Missouri


MAY 24 2005

FILE: St. Louis Ordnance Plant SS
St. Louis Co.

Matt Blunt, Governor • Doyle Childers, Director

Hazardous Waste Program
MO Dept. of Natural Resources**DEPARTMENT OF NATURAL RESOURCES**

www.dnr.mo.gov

MEMORANDUM

DATE: May 20, 2005

TO: Shawn Muenks, Environmental Specialist
Superfund Section, Hazardous Waste Program,
Air and Land Protection Division

FROM: Peter Bachle, Geologist *Peter Bachle*
Geological Survey Program,
Geological Survey and Resource Assessment Division (GSRAD)

SUBJECT: Geohydrologic Summary of St. Louis Ordnance Plant Site

LOCATION: Projected SE ¼ of Section 30, NE ¼ of Section 31, and most of Section 32,
Township 46 North, Range 7 East, Clayton 7.5-Minute Quadrangle,
St. Louis City, Missouri
Centered at 38° 41' 18" North Latitude and 90° 15' 32" West Longitude

LOCATION AND PHYSIOGRAPHIC SETTING

The St. Louis Ordnance Plant site is located on low rolling hills and a broad valley surrounded by residential and commercial property in northwest St. Louis City, Missouri. The site lies within the projected SE ¼ of Section 30, NE ¼ of Section 31, and most of Section 32, Township 46 North, Range 7 East. Approximate coordinates for the site are 38° 41' 18" north latitude and 90° 15' 32" west longitude. Elevation at the site ranges from 468 to 582 feet above mean sea level (USGS, 1993).

The St. Louis Ordnance Plant site lies in the southeast portion of the Dissected Till Plains sub-province of the Central Lowlands physiographic province in Missouri, which is characterized by mixed smooth plains and rolling hills developed on glacial material deposits (Fenneman, 1938).

GROUNDWATER PATHWAY

Pennsylvanian-age shale and sandstone comprise the Western Interior Plains Confining Unit beneath the site. Below this confining unit lie Mississippian-age limestones of the Springfield Plateau Aquifer (Imes and Smith, 1990).

GSRAD files contain no record of current groundwater use locally. However, no laws preclude groundwater use in the future. Since there are records of abandoned wells within 4 miles of the site, it may be possible that some previously used wells were not properly plugged. This may have led to contaminant conduits through the overlying Western Interior Plains Confining Unit. Therefore, the Springfield Plateau Aquifer is characterized in this report.

The GSRAD databases contain no records of wells within a 4-mile radius of the St. Louis Ordnance Plant site. All residences and industries within 4 miles of the site are serviced by municipal water supplies.

Stratigraphic unit descriptions are based on logged mineral test wells located within a 3-mile radius of the site. Table 1 lists the geohydrologic properties (thickness, lithology, nature of porosity and permeability, hydraulic conductivity, and hydrologic unit) of the strata beneath the site.

Residuum and Soil

Stratigraphy

Residuum and Soil: The soil beneath the St. Louis Ordnance Plant site is Urban-Harvester silty clay loam that is composed of roughly eighteen to thirty-five percent clay (Benham, 1982). The silty clay residuum and soil thickness varies greatly due to anthropogenic alteration, however it may be up to 40 feet thick beneath the site.

Hydrology

The Urban-Harvester soils are slightly acidic to neutral (pH 5.6 to 7.3) and permeability is moderate (0.2 to 2.0 inches per hour) (Benham, 1982). The hydraulic conductivity is roughly 1.4×10^{-3} to 1.4×10^{-4} centimeters per second (cm/s). Groundwater flow direction within the residuum is, on average, toward the east due to topographic control.

Western Interior Plains Confining System

Stratigraphy

Pennsylvanian-Age Shale and Sandstone: The Pennsylvanian-age rocks beneath the site are divided into the Marmaton and Cherokee Groups. The bottom of the Marmaton Group is exposed at the surface in a few locations on the site. The Marmaton Group locally consists of shale (5 to 35 feet thick). The Cherokee Group is locally composed of sandstone (30 to 100 feet thick) (Logmain, 2005; Thompson, 1995). The Pennsylvanian-age rocks beneath the site extend from near surface to roughly 120 feet below ground surface.

Hydrology

Even though the Western Interior Plains Confining System is defined as an aquitard as a unit, there are several (up to 30 feet thick) water bearing members interspersed throughout the system. The hydraulic conductivity of the Western Interior Plains Confining System ranges from 3.0×10^{-6} to 6.1×10^{-7} cm/s (Davis, 1969; Imes and Emmett, 1994).

The Western Interior Plains Confining System groundwater flow direction has not been established locally. Due to the proximity to the Mississippi River (a major discharge setting), groundwater within the strata may flow toward the east.

Springfield Plateau Aquifer

Stratigraphy

Mississippian-Age Limestone: The Mississippian-age rocks beneath the site are divided into the Ste. Genevieve and St. Louis Limestones, Salem and Warsaw Formations, Burlington-Keokuk Limestone, and Fern Glen Formation. Locally, these formations consist of limestone, cherty limestone, and argillaceous limestone units (Thompson, 1995). The Mississippian-age rocks beneath the site extend from roughly 120 feet below the ground surface to approximately 720 feet below ground surface.

Hydrology

The stratigraphic units of the Springfield Plateau Aquifer lie immediately below the Pennsylvanian-age sandstone and should be considered in hydraulic interconnection from the top to the base of the aquifer. The hydraulic conductivity of the Springfield Plateau Aquifer is roughly 7.8×10^{-3} cm/sec (Imes and Smith, 1990).

The Springfield Plateau Aquifer groundwater flow direction has not been established locally; however, regional flow is likely toward the east due to the base level of the Mississippi River.

Ozark Confining Unit

Stratigraphy

Chouteau Group: The Chouteau Group is locally characterized by fine- to medium-crystalline limestone grading to dolomite with shale partings in the upper parts. The strata is about 50 feet thick locally (Logmain, 2005).

Hydrology

Regionally, the Ozark Confining Unit is an effective barrier to downward groundwater movement. However, in this area it is unclear if this unit is present as an effective aquitard. The Chouteau Group may have hydraulic conductivity as high as 1×10^{-5} cm/sec (Davis, 1969; Imes, 1990a).

STRUCTURAL FEATURES

There are no known structural features within 4 miles of the site that would influence groundwater flow.

SURFACE WATER PATHWAY

Potential Point of Entry (PPE)

Most surface water leaving the site enters storm water drains. However, surface water leaving the St. Louis Ordnance Plant site that does not enter the storm water conduits flows roughly 2.4 miles east along drainage ditches until reaching the Mississippi River. This point is the potential point of entry (PPE). The PPE lies at the mile marker 185 of the Mississippi River. The Mississippi River flows 15 miles south before reaching the 15-mile downstream limit. The 15-mile downstream limit lies at the Mississippi River mile marker 170 on the Webster Groves 7.5-minute quadrangle.

There are no public drinking water intakes within 15 miles downstream of the site.

Miscellaneous Surface Water Characteristics

The site lies within a 100-year floodplain. The surface water runoff area on and up gradient from the site is greater than 500 acres. The 2-year, 24-hour rainfall is approximately 3.5 inches (Weather Bureau, 1961).

Average flow volume of the Mississippi River at St. Louis City (precise location is unknown) is approximately 186,100 cubic feet per second. (Vandike, 1995)

REFERENCES

- Benham, K. E., 1982, Soil Survey of St. Louis County and St. Louis City, Missouri: United States Department of Agriculture, 137p. 17 maps.
- Davis, S. N., 1969, Porosity and permeability of natural materials. *Flow through porous media*, ed.: R.J.M. De Wiest. Academic Press, pp. 54 – 89.
- Emmett, L. F. and Jeffery, H. G., 1968, Reconnaissance of the Ground-Water Resources of the Missouri River Alluvium Between St. Charles and Jefferson City, Missouri: U.S. Geological Survey Hydrologic Investigations Atlas HA-315, 1 sheet.
- Fenneman, N. M., 1938, Physiography of Eastern United States: McGraw-Hill, New York, 714p.
- Imes, J. L. and L. F. Emmett, 1994, Geohydrology of the Ozark Plateaus Aquifer System in parts of Missouri, Arkansas, Oklahoma, and Kansas: U.S. Geological Survey Professional Paper 1414-D, 127 p.
- Imes, J. L. and B. J. Smith, 1990, Aerial extent, stratigraphic relation, and geohydrologic properties of regional geohydrologic units in southern Missouri: USGS Hydrogeologic Investigations Atlas HA-711-I, 3 sheets.
- Logmain, 2005, Well logs from GSRAD Logmain database: unpublished, #25485 and 3522.
- Thompson, T. L., 1995, The Stratigraphic Succession in Missouri: Missouri Department of Natural Resources, Volume 40 (2nd Series) Revised, 190p.
- United States Geological Survey, 1993, Clayton, Missouri quadrangle: 7.5 Minute Series Topographic Map, 38090-F3-TF-024.

Memo to Shawn Muenks
May 20, 2005
Page 6

Vandike, J. E., 1995, Surface Water Resources of Missouri; Missouri Department of Natural Resources, Volume 1, 122p.

Weather Bureau, 1961, Rainfall frequency atlas of the United States: United States Department of Commerce, Washington D. C., Technical Paper 40.

PFB:lm

Table 1: Aquifer, Stratigraphy, and Hydrology of the St. Louis Ordnance Site

System	Stratigraphic Unit	Thickness (feet)	Lithology	Nature of Porosity and Permeability	Hydraulic Conductivity (cm/sec)	Hydrologic Unit
Post Pennsylvanian	Soil and Residuum	0 - 40	Silty clay loam	Intergranular porosity; Moderate permeability	1.4×10^{-3} to 1.4×10^{-4}	None
Pennsylvanian	Marmaton Group	5 - 35	Shale	Bedding separations and fractures; Low permeability	3.0×10^{-6} to 6.1×10^{-7}	Western Interior Plains Confining System
	Cherokee Group	30 - 100	Sandstone			
Mississippian	Ste. Genevieve and St. Louis Limestones, Salem and Warsaw Formations, Burlington Keokuk Limestone, and Fern Glen Formation	720	Cherty, coarse- grained, fossiliferous limestone	Limestone bedding separations, fractures, and dissolution features; Moderate to high permeability	7.8×10^{-3}	Springfield Plateau Aquifer
	Chouteau Group	50	Argillaceous limestone and shale	Bedding separations, fractures, and possible dissolution features; Moderately low permeability	1×10^{-5}	Ozark Confining Unit

Data is from Davis, 1969; Emmett and Jeffery, 1968; Imes and Smith, 1990; Imes and Emmett, 1994; and Logmain, 2005.

Dark borders between stratigraphic units indicate the unit(s) form a vertical hydraulic boundary.

APPENDIX D
SAMPLING PLAN

SLOP Ex-Army Underground Firing Range
St. Louis, Missouri

Environmental Site Assessment Sampling Plan

**St. Louis Ordnance Plant (SLOP)
Ex-Army Underground Firing Range
St. Louis, Missouri
St. Louis City**

Prepared For:

Missouri Department of Natural Resources
Air and Land Protection Division
Hazardous Waste Program

Prepared By:

Missouri Department of Natural Resources
Air and Land Protection Division
Environmental Services Program

1.0 Introduction

The Missouri Department of Natural Resources (MDNR), Hazardous Waste Program (HWP), Federal Facilities Section (FFS) is conducting a Phase II Environmental Site Assessment (Phase II) on the St. Louis Ordnance Plant (SLOP) Ex-Army Underground Firing Range. The Phase II will investigate the threat to human health and the environment posed by the site. The scope of the investigation will include collecting soil samples, wipe samples of the firing tunnels, pipe insulation and floor tile samples, and samples of paint on the walls to determine the types and concentrations of hazardous substances on-site.

2.0 Site Information

2.1 Location

The SLOP is located at 5700 Lincoln Way in St. Louis, Missouri. Directions to the site are as follows: from Jefferson City go north on Highway 54 to the I-70 intersection. Continue east on I-70 to the Goodfellow exit. Go south on Goodfellow approximately one mile. Turn east on Lincoln Way. The site is on the north side of Lincoln Way.

2.2 Description

The SLOP is on property owned by the city of St. Louis, Missouri and consists of a 3.5-acre parcel that includes a one-story building with a basement, firing vaults, underground firing tunnels, and a concrete bunker. The site is the former location of an underground firing range and was associated with the manufacture and testing of small arms ammunition (0.30 and 0.50 caliber). The site is currently vacant.

2.3 History/Contaminants of Concern

The following RECs exist at the SLOP:

- The likely presence of lead-based paint on the building's interior surfaces.
- The likely presence of asbestos-containing materials (ACM) in the building.
- The likely presence of explosive residues in the firing tunnels and concrete bunker.
- The presence of significant mold throughout the building's interior.
- The likely presence of heavy metals contamination on the property.

Contaminants of concern consist of heavy metals in on-site soils, tunnels, and firing vaults; ACM associated with pipe insulation, ceiling tiles, and floor tiling; and lead-based paint associated with several of the building's interior surfaces.

4.1 Sampling Methods

All aspects of sampling shall be performed using standard operating procedures (SOPs) established within the ESP, Field Services Section for the collection, preservation, and transport of various media sampled. Modifications to the following sampling methods may be made in the field based upon conditions encountered. Any modifications to the methods will be noted in the field logbook and final sampling report submitted to the HWP.

4.1.1 Depth-discrete soil screening/sampling

Five (5) soil borings will be conducted at selected points around the building and grab samples will be collected from discrete depths utilizing a track-mounted hydraulic soil probe. These borings will be advanced to approximately four feet below ground surface to determine concentrations of selected total metals present. Clean disposable heavy-walled polyvinyl chloride (PVC) liners will be inserted into stainless steel macro core samplers fitted with clean cutting shoes. Continuous cores will be collected to the desired depth at each location via drive rods. Each soil core will be retrieved and field screened for heavy metals with a Niton XL700 multi-element analyzer. The instrument will be calibrated, operated, and maintained per the manufacturer's standard operating procedures. See Section 5.3 for specific operations to be followed. One sample from each boring will be collected for confirmatory laboratory analysis based on the results of XRF data. In addition, two soil samples will also be submitted for pesticide analysis. On-site HWP, FFS staff will determine which samples will be submitted for pesticide analysis. Personnel will also inspect each core for visual staining and/or odors.

Personnel will utilize clean stainless steel spoons to transfer each sample to clean aluminum foil pans for homogenization prior to placement into sample containers. Clean 8-ounce glass jars will be used as sample containers.

4.1.2 ACM sampling

Possible ACMs will be sampled directly from their sources. Floor mastic, ceiling tile, and pipe insulation samples will be collected using a clean or field-decontaminated knife or scissors to collect material, which will be placed into sample containers for shipment to a contract laboratory for analysis. Locations and sample numbers will be described in the final report. All sample media will be wetted before collection.

4.1.3 Lead-based paint screening/sampling

A Niton XL700 multi-element analyzer will be used to field screen areas of the property for lead-based paint. Four walls upstairs and four walls downstairs will be surveyed with this instrument. Each wall will be separated into three sections for sampling. If the wall is bare brick with no apparent paint, then the wall will not be sampled. The instrument will be calibrated, operated, and maintained per the manufacturer's standard operating procedures. See Section 5.3 for specific operations to be followed. The areas that are sampled will be marked and described in the final report. If the initial analysis with the instrument indicates a high lead concentration, a sample will be taken from the wall and stored in coolers on ice for potential confirmatory

4.4 Analyses Requested

Soil samples collected to the east and west of the building will be submitted for total metals analyses (Sb, As, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, Tl, Zn). In addition, a subset of these samples will be submitted for organochlorine pesticide analysis.

Surface soil samples collected within the concrete bunker will be submitted for explosives and also Pentaerythritol Tetranitrate (PETN).

Wipe samples on the firing point area and concrete bunker will be submitted for explosives, total metals (the same as listed above), and PETN.

Wipe samples in the interior walls of the firing tunnels and point of impact will be submitted for total metals (the same as listed above), phosphorous, magnesium, and perchlorate.

Confirmatory paint samples will be submitted for total lead analysis.

Potential ACM samples will be transported to a contract laboratory for asbestos analysis.

Instructions will be relayed to analytical personnel that if any soil sample's total analyte results are 80% of twenty times the Toxicity Characteristic Leaching Procedure (TCLP) regulatory limit, TCLP analysis will be performed on that sample

the state's environmental laboratory within the Environmental Services Program in Jefferson City for analyses. Asbestos samples will be shipped to a private laboratory for analysis.

5.0 Data Quality

To help ensure precise, accurate, representative, complete, and comparable data are achieved, all fieldwork and analyses will be conducted in accordance with the Quality Assurance Project Plan for Brownfields Targeted Assessments for fiscal year 2005. Unless otherwise noted in this sampling plan, ESP field personnel will utilize SOPs established within the ESP, Field Services Section for all samples collected.

5.1 Field Methods

Clean disposable nitrile gloves will be worn by sampling personnel and clean or field decontaminated equipment will be utilized for each separate sample collected to minimize the possibility of cross-contamination.

Field personnel shall note all observations, sample locations, descriptions, and methods in a bound field logbook.

5.2 Field Decontamination

Field decontamination of sampling equipment, if required, will be accomplished as follows:

- Nylon brushing with a solution of Simple Green™ cleaner
- Nylon brushing with a solution of Liquinox™ (non-phosphate) cleaner
- Tap water rinse
- Final deionized water rinse

Decontaminated equipment will be stored on clean plastic and allowed to air dry until used again.

5.3 XRF Analyzer Operation

The Niton XL 700 multi-element analyzer employs XRF technology to analyze samples. The manufacturer specifications for instrument operation described in the Niton XL700 manual will be followed. In addition, to ensure consistent use of the instrument, the following protocol will be followed. Results of the calibration check standard, precision sample, and blank analyses will be documented in a field notebook.

- The XRF will be allowed to warm up for at least 15 minutes prior to use.
- A 45-second analysis time will be used for all samples, calibration check standards, and blanks.
- A high concentration NIST calibrations check standard will be analyzed at the beginning of each use (e.g. beginning of the day), followed by a certified blank sand sample.

6.0 Investigation Derived Wastes (IDW) Plan

Efforts will be made to minimize IDW generation. IDW may include soil, decontamination fluids, disposable sampling equipment, and disposable personal protective equipment (PPE).

Field personnel will attempt to return unused soils to their source immediately after generation or, if warranted, containerize and return them to the ESP laboratory for proper disposal. Disposable PPE and disposable sampling equipment will be handled as solid waste, containerized, and properly disposed. Wash and rinse waters generated during equipment decontamination will generally be discharged to the ground on-site or, if warranted, containerized and returned to the ESP laboratory for proper disposal.

7.0 Site Safety

A safety briefing will be held on-site prior to initiating field activities and field personnel will be required to read and sign the site-specific health and safety plan. The site safety plan is attached as Appendix B.

8.0 Reporting

The analytical results of samples collected will be presented, along with methods of collection and observations, in a formal report to be submitted to the HWP.

APPENDIX A

Site Map

**St. Louis Ordnance Plant (SLOP) Ex-Army Underground Firing Range Site
St. Louis, Missouri**

APPENDIX B
Health & Safety Plan
St. Louis Ordnance Plant (SLOP) Ex-Army Underground Firing Range Site
St. Louis, Missouri

**MISSOURI DEPARTMENT OF NATURAL RESOURCES
AIR AND LAND PROTECTION DIVISION
ENVIRONMENTAL SERVICES PROGRAM**

SITE HEALTH AND SAFETY PLAN

1.0 INTRODUCTION

This plan has been prepared for implementation by ESP employees, using operating procedures for which they are specifically trained. Any use of the plan by other agencies, organizations, or private individuals is at their own risk.

2.0 KEY PERSONNEL

MDNR OSC: Hugh Murrell SAFETY OFFICER: Hugh Murrell

OTHER MDNR PERSONNEL/TITLE:

Ken Hannon ES III - ESP

Shawn Muenks ES III - HWP

Scott Robinett ES III - ESP

3.0 SITE INFORMATION

Site name St. Louis Ordnance Plant County/City: St. Louis City/St. Louis

Sampling date: 3/7/05 Site Description: Former underground firing range, currently vacant.

3.1 Overall Incident Risk/Hazard Analysis

Chemical: Serious Moderate XX Low Unknown

Physical: Serious Moderate XX Low Unknown

3.2 Contaminant(s) of Concern: Compounds associated with underground firing ranges, asbestos-containing materials, lead-based paint, possible metals residues on walls.

3.2.1 Physical State: Liquid XX Solid Sludge Gas/Vapor

Chemical Characteristics: (check all that apply)/

<u>XX</u> a. carcinogen	<u>XX</u> b. biological	<u> </u> c. corrosive	<u> </u> d. combustible
<u>XX</u> e. explosive	<u> </u> f. flammable	<u> </u> g. volatile	<u> </u> h. poison
<u> </u> i. radioactive	<u> </u> j. reactive	k. other: <u> </u>	

MDNR-ESP
SITE HEALTH & SAFETY PLAN
PAGE 3

5.0 PERSONAL PROTECTIVE EQUIPMENT

ESP shall utilize the Protection Level categories defined in 29 CFR 1910.120, Appendix B, and known as Levels A, B, C, and D. Refer to Section 2 of the MDNR-HSERP for definitions of Protection Levels. ESP personnel shall inspect APRs and SCBAs at least monthly and maintain a record of such to ensure equipment is functional.

Levels of protection shall be reassessed and upgraded as conditions change and information is updated to comply with worker safety while performing site activities.

Action Levels for evacuation of work zone pending reassessment of conditions:

- Level D: $O_2 < 19.5\%$ or $> 25\%$; explosive atmosphere $> 10\%$ LEL; organic vapors $>$ background levels; other_____.
- Level C: $O_2 < 19.5\%$ or $> 25\%$; explosive atmosphere $> 10\%$ LEL; organic vapors (in breathing zone) > 25 m.u., or 3 times background (whichever is less); other_____.
- Level B: Explosive atmosphere $> 10\%$ LEL; unknown organic vapors (in breathing zone) > 500 m.u.; other_____.
- Level A: ESP personnel shall evaluate the need for entry on a site-specific basis and may utilize its emergency response contractor for Level A situations which may arise.

6.0 FREQUENCY AND TYPE OF AIR MONITORING/SAMPLING

Instrument	Contaminant of Concern	Sample Location (Area/Source)	Frequency	Odor Threshold/ Description
N/A				

Hospital: Barnes-Jewish Hospital
216 S. Kingshighway Blvd., St. Louis, MO 314/747-3000

	<u>Name/Location</u>	<u>Telephone Number</u>
Ambulance:	St. Louis City Ambulance	314/645-9160
Police/Sheriff:	St. Louis City Police	314/444-5555
Fire:	St. Louis Fire Department	314/533-3406

Cellular Telephones/Other: Brian Allen cell – 573/619-1684 Ken Hannon cell – 573/694-2063

WORK RELATED INJURY: 800/624-2354 = This number is to be called in the event of a NON-LIFE THREATENING injury PRIOR to seeking medical care.

ESP personnel shall certify they have read the plan and addressed any questions regarding worker health and safety by signing and dating below followed by printing their name and title.

TLD Badge

[illegible]

APPENDIX E
SAMPLING REPORT

SLOP Ex-Army Underground Firing Range
St. Louis, Missouri

Phase II Environmental Site Assessment Sampling Report

**St. Louis Ordnance Plant (SLOP)
Ex-Army Underground Firing Range
St. Louis, Missouri
St. Louis City**

March 7, 2005

Prepared For:

Missouri Department of Natural Resources
Air and Land Protection Division
Hazardous Waste Program

Prepared By:

Missouri Department of Natural Resources
Air and Land Protection Division
Environmental Services Program

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Table 1 – Sample Collection Data

Appendix A – Site Map

Appendix B – Analytical Results

Appendix C – Photographs

1.0 Introduction

The Missouri Department of Natural Resources (MDNR), Hazardous Waste Program (HWP), Federal Facilities Section (FFS) is conducting a Phase II Environmental Site Assessment (Phase II) on the St. Louis Ordnance Plant (SLOP) Ex-Army Underground Firing Range. The Phase II is investigating the threat to human health and the environment posed by the site. The HWP, FFS requested the MDNR, Environmental Services Program (ESP) to prepare and implement a sampling plan as part of the Phase II.

On March 7, 2005, ESP Environmental Specialists Hugh Murrell, Ken Hannon, and Scott Robinett traveled to the site to conduct sampling. HWP Environmental Engineer Shawn Muenks was present during the sampling event to observe field activities and direct sampling locations. The scope of the sampling investigation included collecting soil samples, wipe samples of the firing tunnels, pipe insulation and floor tile samples, and samples of paint on the walls to determine the types and concentrations of hazardous substances on-site.

2.0 Site Information

2.1 Location

The SLOP is located at 5700 Lincoln Way in St. Louis, Missouri. Directions to the site are as follows: from Jefferson City go north on Highway 54 to the I-70 intersection. Continue east on I-70 to the Goodfellow exit. Go south on Goodfellow approximately one mile. Turn east on Lincoln Way. The site is on the north side of Lincoln Way. The site is described as US Survey #1913, Township 46N, Range 7E of the 5th Principal. Geographic coordinates for the site are presented in Table 1 as determined with a Lowrance GlobalMap 100 unit.

2.2 Description

The SLOP is on property owned by the city of St. Louis, Missouri and consists of a 3.5-acre parcel that includes a one-story building with a basement, firing vaults, underground firing tunnels, and a concrete bunker. The site is the former location of an underground firing range and was associated with the manufacture and testing of small arms ammunition (0.30 and 0.50 caliber). The site is currently vacant.

2.3 History/Contaminants of Concern

At the SLOP, the following RECs exist:

- The likely presence of lead-based paint on the building's interior surfaces.
- The likely presence of asbestos-containing materials (ACM) in the building.
- The likely presence of explosive residues in the firing tunnels and concrete bunker.
- The presence of significant mold throughout the building's interior.

- The likely presence of heavy metals contamination on the property.

Contaminants of concern consist of heavy metals, pesticides, and explosive residues in on-site soils, heavy metals and explosive residues in tunnels and firing vaults; ACMs associated with pipe insulation, ceiling tiles, and floor tiling; and lead-based paint associated with several of the building's interior surfaces.

3.0 Methods

3.1 Field Procedures

A health and safety briefing was conducted on-site and personnel read and signed the site-specific health and safety plan prior to initiating field activities.

Missouri One-Call was notified of proposed field activities prior to ESP personnel arriving on-site and all applicable underground utilities marked.

As specified in the sampling plan, ESP personnel performed field-screening analysis for lead-based paint using X-ray fluorescence technology (XRF). Personnel collected paint samples from a subset of the screening locations for confirmatory laboratory analysis. Personnel also conducted field-screening analysis of depth-discrete soil samples collected from borings surrounding the building for selected metals. A subset of those samples was submitted for confirmatory laboratory analysis. Personnel also collected grab samples of pipe insulation, mastic, and floor tiling for asbestos analysis. Personnel also collected wipe samples of firing tunnels and firing vaults for laboratory analysis of explosives residue and heavy metals.

All sample locations and descriptions were noted in a bound field logbook and locations noted on a site map. Personnel determined global positioning system (GPS) coordinates of all sampling locations outside the building. Sample locations within the building were noted and identified on a site sketch.

Each depth discrete soil sample location was identified as soil boring (SB-) X, where X represented a number unique to each location. Each surface soil sample location was identified as surface soil (SS-) X, where X represented a number unique to each location. ESP personnel calibrated the XRF Niton XL700 instrument following manufacturers' specifications. Photographs of the site and sampling locations were taken, which are attached as Appendix C.

All aspects of sampling were performed using standard operating procedures (SOPs) established within the ESP, Field Services Section for the collection, preservation, and transport of various media sampled.

3.1.1 Depth-discrete soil sampling

Depth-discrete soil grab samples were collected utilizing a track-mounted hydraulic soil probe. Clean disposable acetate liners were inserted into stainless steel macro core samplers fitted with clean cutting shoes. The core samplers were advanced to the desired sampling depth via drive rods and the samplers and soil retrieved. The acetate liners were removed and cut open exposing the soil. Personnel utilized clean stainless steel spoons to remove soil for analyses. Each sample was transferred to a clean aluminum foil pan, homogenized, and placed into sample containers.

3.1.2 Surface soil sampling

Personnel utilized clean stainless steel spoons to collect surface soil samples from the 0- to 2-inch depth, which were transferred to clean aluminum foil pans, homogenized, and placed into sample containers.

3.1.3 ACM sampling

Possible ACMs were sampled directly from their sources. Floor mastic and pipe insulation samples were collected using a knife and scissors to remove the material, which was placed into sample containers for shipment to a contract laboratory for analysis. All samples were wetted with deionized water prior to placement in the baggies.

3.1.4 Lead-based paint sampling

A Niton XL700 multi-element analyzer was used to field screen areas of the property for lead-based paint. Four walls in three regions of the site were surveyed with this instrument. Each wall was separated into three sections for sampling. One confirmatory sample from each wall was taken from the area with the highest reading for lead. Each sample was placed into a plastic bag. The sampled areas were marked and are described Table 1.

3.1.5 Wipe sampling – Firing Point Area

At the firing points in the main building, wipe samples were taken for the presence of total metals (Sb, As, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, Tl, Zn), explosives, and Pentaerythritol Tetranitrate (PETN). For the PETN and explosives, a sterile piece of gauze soaked in acetone was used to collect a wipe sample from within a 100-cm² template placed over the oil-stained surface, which was subsequently placed into an 8-ounce glass jar. For the metals, the same procedure was used, except for using deionized water as the solvent for the gauze.

3.1.6 Wipe sampling – Concrete Bunker Area

In the concrete bunker area, wipe samples were taken for the presence of total metals (the same as in the above section), explosives, and PETN. For the PETN and explosives, a sterile piece of gauze soaked in acetone was used to collect a wipe sample from within a 100-cm² template placed over the oil-stained surface, which was inserted into an 8-ounce glass jar. For the metals, the same procedure was used, except for using deionized water as the solvent for the gauze.

3.1.7 Wipe sampling – Point of Impact/Interior Walls of Firing Tunnels

In the concrete bunker area, wipe samples were taken for the presence of total metals (the same as in the above section), phosphorous, magnesium, and perchlorate. For all parameters, a sterile piece of gauze soaked in deionized water was used to collect a wipe sample from within a 100-cm² template placed over the oil-stained surface, which was inserted into an 8-ounce glass jar.

3.2 Sample Quantity

A total of twelve soils, ten wipes, six lead-based paint, and eight asbestos samples were collected during the sampling event. Refer to Table 1 for the identity, location, date, and time of each sample collected and Appendix A (site map) for the sample locations relative to the site.

3.3 Chain-of-Custody

All samples received a numbered label and the corresponding number was entered onto a chain-of-custody form indicating the location, date and time of collection, and analytes requested. Samples were stored and transported on ice in coolers. ESP field personnel maintained custody of the samples until relinquishing them to a sample custodian at the state's environmental laboratory within the Environmental Services Program in Jefferson City for analyses or for shipment to a contract laboratory.

3.4 Analyses Requested

Soil samples collected to the east and west of the building were submitted for total metals analyses (Sb, As, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, Tl, Zn). In addition, a subset of these samples was submitted for organochlorine pesticide analysis. Surface soil samples collected within the concrete bunker were submitted for pesticides, explosives, and PETN. Wipe samples on the firing point area and concrete bunker were submitted for explosives, total metals (the same as listed above), and PETN. Wipe samples in the interior walls of the firing tunnels and point of impact were submitted for total metals (the same as listed above), phosphorous, magnesium and perchlorate. Confirmatory paint samples were submitted for total lead analysis. Potential ACM samples were shipped to a contract laboratory for asbestos analysis.

Instructions were relayed to analytical personnel that if any soil sample's total analyte results were 80% of twenty times the Toxicity Characteristic Leaching Procedure (TCLP) regulatory limit, TCLP analysis would be performed on that sample.

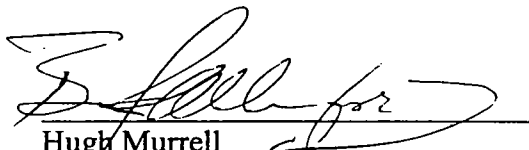
4.0 Data Quality

To help ensure precise, accurate, representative, complete, and comparable data was achieved, all fieldwork and analyses were conducted in accordance with the Quality Assurance Project Plan for Brownfields Targeted Assessments for fiscal year 2005. Unless otherwise noted in this sampling report, ESP field personnel utilized standard operating procedures established within the ESP, Field Services Section for all samples collected.


7.0 Reporting

Please refer to Appendix B for analytical results of samples collected. Copies of the chain-of-custody forms and ESP field notes were previously forwarded to HWP personnel as requested.


Submitted by:


Hugh Murrell
Environmental Specialist
Superfund/RCRA Unit
Environmental Services Program

Date:


6/1/05

Approved by:


Earl Pabst
Director
Environmental Services Program

EP:hmt

c: Shawn Muenks, Environmental Engineer, HWP

4.1 Field Methods

Clean disposable nitrile gloves were worn by sampling personnel and clean or field decontaminated equipment was utilized for each separate sample collected to minimize the possibility of cross-contamination.

Field personnel noted all observations, sample locations, descriptions, and methods in a bound field logbook.

All samples were collected in certified-clean containers and preserved in the field as appropriate.

4.2 Field Decontamination

Field decontamination of sampling equipment was not required.

4.3 Field Quality Assurance/Quality Control Samples

4.3.1 Duplicate (collocated) samples

One duplicate wipe sample was collected during the sampling event. The duplicate sample was collected alongside its true sample using the same technique as for the true sample. The duplicate sample was assigned a unique sample number, was entered onto the chain-of-custody form as "duplicate," and was submitted for the same analytes as its true sample.

5.0 Investigation Derived Wastes (IDW)

Field personnel returned unused soils to their source immediately after generation. Disposable personal protective equipment and disposable sampling equipment were handled as solid waste, containerized, and properly disposed.

6.0 Observations

The weather during the sampling event was cloudy with temperatures reaching approximately 50 degrees Fahrenheit. Winds were predominantly from the west at five miles per hour. Notable site conditions included a lot of overgrown trees and weeds, which were cleared by the maintenance crew from the city of St. Louis to make room for the soil probe equipment. The building itself was in a state of decay due to inactivity for approximately 30+ years. The decision was made to advance soil borings B1 and B5 to 12 feet below ground surface since these borings were in the spots where the original bullet traps were. The decision was then made to collect three samples from three different intervals instead of just one interval.

It was discovered after the investigation that PETN analysis was not possible at any of the laboratories that were queried.

Please refer to Table 1 for observations noted on each sample submitted for laboratory analyses.

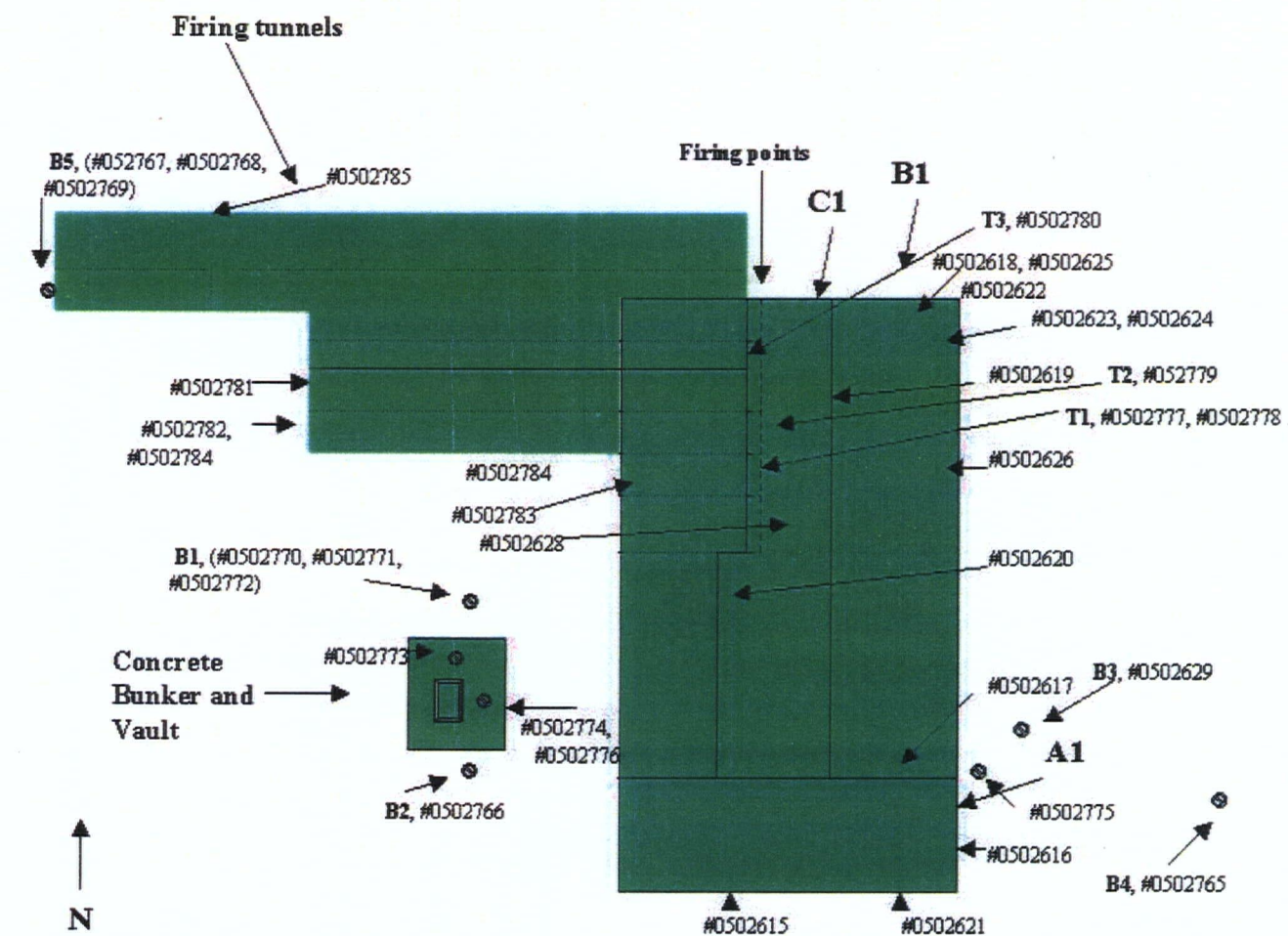
TABLE
St. Louis Ordnance Plant (SLOP) Site
Ex-Army Underground Firing Range
St. Louis, Missouri
St. Louis City

Table 1
St. Louis Ordnance Plant (SLOP) Site, St. Louis City, Missouri

Soil Sample Collection Data			
Sample Number	Date Collected	Time Collected	Location Collected/Description
0502615	3/07/05	1133	Lead-based paint sample from A1 south wall.
0502616	3/07/05	1145	Lead-based paint sample from A1 east wall.
0502617	3/07/05	1155	Lead-based paint sample from B1 south wall.
0502618	3/07/05	1203	Lead-based paint sample from B1 north wall.
0502619	3/07/05	1215	Lead-based paint sample from C1 east wall.
0502620	3/07/05	1220	Lead-based paint sample from C1 west wall.
0502621	3/07/05	1225	Asbestos-Containing Material (ACM) pipe wrap from A1 south wall.
0502622	3/07/05	1230	Asbestos-Containing Material (ACM) tile from B1 north end.
0502623	3/07/05	1237	Asbestos-Containing Material (ACM) pipe wrap from basement.
0502624	3/07/05	1242	Asbestos-Containing Material (ACM) pipe wrap from basement bathroom.
0502625	3/07/05	1245	Asbestos-Containing Material (ACM) transite from side of building on north end.
0502626	3/07/05	1249	Asbestos-Containing Material (ACM) ceiling tile from B1.
0502627	3/07/05	1252	Asbestos-Containing Material (ACM) tunnel insulation.
0502628	3/07/05	1255	Asbestos-Containing Material (ACM) floor mastic from firing tunnel hallway.
0502629	3/07/05	1348	Soil boring B-3, depth of 0-4 feet, brown silty clay, no odor.
0502765	3/07/05	1353	Soil boring B-4, depth of 0-4 feet, brown silty clay, no odor.
0502766	3/07/05	1400	Soil boring B-2, depth of 0-4 feet, brown silty clay, no odor.
0502767	3/07/05	1430	Soil boring B-5, depth of 0-4 feet, brown clayey silt, some rock, no odor.
0502768	3/07/05	1437	Soil boring B-5, depth of 4-8 feet, brown clayey silt, no odor.
0502769	3/07/05	1440	Soil boring B-5, depth of 8-12 feet, brown silty clay with some sand, no odor.
0502770	3/07/05	1446	Soil boring B-1, depth of 0-4 feet, brown silty clay, no odor.
0502771	3/07/05	1449	Soil boring B-1, depth of 4-8 feet, brown silty clay, no odor.
0502772	3/07/05	1454	Soil boring B-1, depth of 8-12 feet, brown silty clay, no odor.
0502773	3/07/05	1455	Surface soil sample at vault entrance in bunker.
0502774	3/07/05	1500	Surface soil sample on floor of bunker, east of the vault.
0502775	3/07/05	1505	Surface soil sample at east end of building.
0502776	3/07/05	1519	Wipe sample in concrete bunker.
0502777	3/07/05	1530	Wipe sample from firing point T1.
0502778	3/07/05	1530	Duplicate sample.
0502779	3/07/05	1540	Wipe sample from firing point T2.
0502780	3/07/05	1550	Wipe sample from firing point T3.
0502781	3/7/05	1600	Wipe sample from point of impact on skipped tunnel.
0502782	3/7/05	1610	Wipe sample from vent top on T2.
0502783	3/07/05	1615	Wipe sample from point of impact on T1.
0502784	3/07/05	1625	Wipe sample from short tunnel.
0502785	3/07/05	1635	Wipe sample from long tunnel.

APPENDIX A
Site Map
St. Louis Ordnance Plant (SLOP) Site
Ex-Army Underground Firing Range
St. Louis, Missouri
St. Louis City

St. Louis Ordnance Plant (SLOP) Site **5700 Lincoln Way**



APPENDIX F
CHAIN OF CUSTODY/LABORATORY RESULTS

SLOP Ex-Army Underground Firing Range
St. Louis, Missouri

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MISSOURI DEPARTMENT OF NATURAL RESOURCES
FIELD SHEET AND CHAIN-OF-CUSTODY RECORD

LABORATORY USE ONLY

MO Dept. of Natural Resources

Collector's Name: Hugh Murrell								Description of Shipment			
Affiliation: ESP KCRO NERO SERO SLRO SWRO WPP GSRAD HWP Other:								Shipped-Carrier:			
								Tape sealed and initialed			
								<input checked="" type="checkbox"/> Hand Delivered			
								No. Of Containers:			
Sample Number	Sample Collected	Analyses						Sample Type	For Lab Use Only		
	Date:								Matrix	Container	Preserved
0502615 (Sample A)	3/7/05	lead						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
								<input type="checkbox"/> Composite	Soil	Cubitainer	HNO ₃
								<input type="checkbox"/> Modified	<input checked="" type="checkbox"/> Organic	2 oz glass	NAOH
								Other:	Sludge	8 oz glass	HCL
For Lab Use Only	Time: 1133	D.O.	Flow	pH	Spec. Cond.	Temp.	Other:		Other:	VOA vial	4° C (None)
										Encore	Disinfected
										<input checked="" type="checkbox"/> Other: Ziplock	Other
0502616 (Sample B)	3/7/05	lead						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
								<input type="checkbox"/> Composite	Soil	Cubitainer	HNO ₃
								<input type="checkbox"/> Modified	<input checked="" type="checkbox"/> Organic	2 oz glass	NAOH
								Other:	Sludge	8 oz glass	HCL
For Lab Use Only	Time: 1145	D.O.	Flow	pH	Spec. Cond.	Temp.	Other:		Other:	VOA vial	4° C (None)
										Encore	Disinfected
										<input checked="" type="checkbox"/> Other: Ziplock	Other
0502617 (Sample C)	3/7/05	lead						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
								<input type="checkbox"/> Composite	Soil	Cubitainer	HNO ₃
								<input type="checkbox"/> Modified	<input checked="" type="checkbox"/> Organic	2 oz glass	NAOH
								Other:	Sludge	8 oz glass	HCL
For Lab Use Only	Time: 1155	D.O.	Flow	pH	Spec. Cond.	Temp.	Other:		Other:	VOA vial	4° C (None)
										Encore	Disinfected
										<input checked="" type="checkbox"/> Other: Ziplock	Other
0502618 (Sample D)	3/7/05	lead						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
								<input type="checkbox"/> Composite	Soil	Cubitainer	HNO ₃
								<input type="checkbox"/> Modified	<input checked="" type="checkbox"/> Organic	2 oz glass	NAOH
								Other:	Sludge	8 oz glass	HCL
For Lab Use Only	Time: 1203	D.O.	Flow	pH	Spec. Cond.	Temp.	Other:		Other:	VOA vial	4° C (None)
										Encore	Disinfected
										<input checked="" type="checkbox"/> Other: Ziplock	Other
Relinquished By: Hugh Murrell		Received By: Maria S Thompson						Date: 3-8-05	Time: 1545		
Relinquished By:		Received By:						Date:	Time:		
Relinquished By:		Received By:						Date:	Time:		

COPY

Sample I.D. Letter	Site Description			LDPR Code	Job Code
Sample A	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): Wall sample A1 South				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):				
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
Sample B	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): Wall sample A1 East				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):				
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
Sample C	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): Wall sample B1 South				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):				
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
Sample D	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): Wall sample B1 North				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):				
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
REMARKS:					



MISSOURI DEPARTMENT OF NATURAL RESOURCES
FIELD SHEET AND CHAIN-OF-CUSTODY RECORD

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LABORATORY ORDER ID: _____

Collector's Name: Hugh Murrell								Description of Shipment			
Affiliation: (Please Print) (ESP) KCRO NERO SERO SLRO SWRO WPP								Shipped-Carrier: _____			
Affiliation: (circle one) GSRAD HWP Other:								Tape sealed and initialed _____			
								<input checked="" type="checkbox"/> Hand Delivered			
								No. Of Containers: _____			

Sample Number	Sample Collected	Analyses						Sample Type	For Lab Use Only		
								Matrix	Container	Preserved	
0502619 (Sample A)	Date: 3/7/05	lead						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
								<input type="checkbox"/> Composite	Soil	Cubitainer	HNO ₃
								<input type="checkbox"/> Modified	<input checked="" type="checkbox"/> Organic	2 oz glass	NAOH
For Lab Use Only	Time: 1215	D.O.	Flow	pH	Spec. Cond.	Temp.	Other:	Other:	Sludge	8 oz glass	HCL
									VOA vial	1 4° C (None)	Disinfected
									Encore	Other: Ziplock	Other
0502620 (Sample B)	Date: 3/7/05	lead						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
								<input type="checkbox"/> Composite	Soil	Cubitainer	HNO ₃
								<input type="checkbox"/> Modified	<input checked="" type="checkbox"/> Organic	2 oz glass	NAOH
For Lab Use Only	Time: 1220	D.O.	Flow	pH	Spec. Cond.	Temp.	Other:	Other:	Sludge	8 oz glass	HCL
									VOA vial	1 4° C (None)	Disinfected
									Encore	Other: Ziplock	Other
0502621 (Sample C)	Date: 3/7/05	Asbestos						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
								<input type="checkbox"/> Composite	Soil	Cubitainer	HNO ₃
								<input type="checkbox"/> Modified	<input checked="" type="checkbox"/> Organic	2 oz glass	NAOH
For Lab Use Only	Time: 1225	D.O.	Flow	pH	Spec. Cond.	Temp.	Other:	Other:	Sludge	8 oz glass	HCL
									VOA vial	1 4° C (None)	Disinfected
									Encore	Other: Ziplock	Other
0502622 (Sample D)	Date: 3/7/05	Asbestos						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
								<input type="checkbox"/> Composite	Soil	Cubitainer	HNO ₃
								<input type="checkbox"/> Modified	<input checked="" type="checkbox"/> Organic	2 oz glass	NAOH
For Lab Use Only	Time: 1230	D.O.	Flow	pH	Spec. Cond.	Temp.	Other:	Other:	Sludge	8 oz glass	HCL
									VOA vial	1 4° C (None)	Disinfected
									Encore	Other: Ziplock	Other

Relinquished By: Hugh Murrell	Received By: Marla S. Thompson	Date: 3-8-05	Time: 1545
Relinquished By: _____	Received By: _____	Date: _____	Time: _____
Relinquished By: _____	Received By: _____	Date: _____	Time: _____

Sample I.D. Letter	Site Description			LDPR Code	Job Code
Sample A	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): Wall sample C1 East				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):				
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
Sample B	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): Wall sample C1 West				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):				
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
Sample C	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): ACM PIPE WRAP A1 South				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):				
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
Sample D	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): ACM TILE B1 North end				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):				
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
REMARKS:					



MISSOURI DEPARTMENT OF NATURAL RESOURCES
FIELD SHEET AND CHAIN-OF-CUSTODY RECORD

Page 1 of 2

LABORATORY ORDER ID: _____

Collector's Name: Hugh Murrell								Description of Shipment			
Affiliation: <u>ESP</u> KCRO NERO SERO SLRO SWRO WPP								Shipped-Carrier: _____			
GSRAD HWP Other: _____								Tape sealed and initialed _____			
								<input checked="" type="checkbox"/> Hand Delivered			
								No. Of Containers: _____			
Sample Number	Sample Collected	Analyses						Sample Type	For Lab Use Only		
								Matrix	Container	Preserved	
0502623 (Sample A)	Date: 3/7/05	Asbestos						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
								<input type="checkbox"/> Composite	Soil	Cubitainer	HNO ₃
								<input type="checkbox"/> Modified	<input checked="" type="checkbox"/> Organic	2 oz glass	NAOH
For Lab Use Only	Time: 1237	D.O	Flow	pH	Spec. Cond.	Temp.	Other:	Sludge	8 oz glass	HCL	
								Other:	VOA vial	4° C (None)	
									Encore	Disinfected	
									Other: Ziplock	Other	
0502624 (Sample B)	Date: 3/7/05	Asbestos						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
								<input type="checkbox"/> Composite	Soil	Cubitainer	HNO ₃
								<input type="checkbox"/> Modified	<input checked="" type="checkbox"/> Organic	2 oz glass	NAOH
For Lab Use Only	Time: 1242	D.O	Flow	pH	Spec. Cond.	Temp.	Other:	Sludge	8 oz glass	HCL	
								Other:	VOA vial	4° C (None)	
									Encore	Disinfected	
									Other: Ziplock	Other	
0502625 (Sample C)	Date: 3/7/05	Asbestos						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
								<input type="checkbox"/> Composite	Soil	Cubitainer	HNO ₃
								<input type="checkbox"/> Modified	<input checked="" type="checkbox"/> Organic	2 oz glass	NAOH
For Lab Use Only	Time: 1245	D.O	Flow	pH	Spec. Cond.	Temp.	Other:	Sludge	8 oz glass	HCL	
								Other:	VOA vial	4° C (None)	
									Encore	Disinfected	
									Other: Ziplock	Other	
0502626 (Sample D)	Date: 3/7/05	Asbestos						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
								<input type="checkbox"/> Composite	Soil	Cubitainer	HNO ₃
								<input type="checkbox"/> Modified	<input checked="" type="checkbox"/> Organic	2 oz glass	NAOH
For Lab Use Only	Time: 1249	D.O	Flow	pH	Spec. Cond.	Temp.	Other:	Sludge	8 oz glass	HCL	
								Other:	VOA vial	4° C (None)	
									Encore	Disinfected	
									Other: Ziplock	Other	
Relinquished By: Hugh Murrell		Received By: Maria S Thompson						Date: 3-8-05	Time: 1545		
Relinquished By:		Received By:						Date:	Time:		
Relinquished By:		Received By:						Date:	Time:		

Sample I.D. Letter	Site Description			LDPR Code	Job Code
Sample A	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): ACM PIPE BASEMENT				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):				
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>			
Sample B	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): ACM PIPE BASEMENT BATHROOM				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):				
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>			
Sample C	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): ACM Transite N end of building				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):				
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>			
Sample D	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): ACM Ceiling tile B1				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):				
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>			
REMARKS:					



MISSOURI DEPARTMENT OF NATURAL RESOURCES
FIELD SHEET AND CHAIN-OF-CUSTODY RECORD

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LABORATORY ORDER ID: _____

Collector's Name: Hugh Murrell								Description of Shipment			
Affiliation: (Please Print) <u>ESP</u> KCRO NERO SERO SLRO SWRO WPP								Shipped-Carrier: _____			
circle one) GSRAD HWP Other: _____								Tape sealed and initialed _____			
								Hand Delivered _____			
								No. Of Containers: _____			
Sample Number	Sample Collected	Analyses						Sample Type	For Lab Use Only		
	Date:							Matrix	Container	Preserved	
0502627 (Sample A)	3/7/05	Asbestos						<input checked="" type="checkbox"/> Grab <input type="checkbox"/> Composite <input type="checkbox"/> Modified <input type="checkbox"/> Other:	Water <input type="checkbox"/> Soil <input checked="" type="checkbox"/> Organic <input type="checkbox"/> Sludge <input type="checkbox"/> Other:	1L amber Cubitainer 2 oz glass 8 oz glass VOA vial Encore Other: <u>Ziplock</u>	H ₂ SO ₄ HNO ₃ NAOH HCL 4° C (None) Disinfected Other:
For Lab Use Only	Time: 1252	D.O	Flow	pH	Spec. Cond.	Temp.	Other:				
0502628 (Sample B)	3/7/05	Asbestos						<input checked="" type="checkbox"/> Grab <input type="checkbox"/> Composite <input type="checkbox"/> Modified <input type="checkbox"/> Other:	Water <input type="checkbox"/> Soil <input checked="" type="checkbox"/> Organic <input type="checkbox"/> Sludge <input type="checkbox"/> Other:	1L amber Cubitainer 2 oz glass 8 oz glass VOA vial Encore Other: <u>Ziplock</u>	H ₂ SO ₄ HNO ₃ NAOH HCL 4° C (None) Disinfected Other:
For Lab Use Only	Time: 1255	D.O	Flow	pH	Spec. Cond.	Temp.	Other:				
0502629 (Sample C)	3/7/05	Total Metals (Sb, As, Be, Cd, Cu, Pb, Hg, Ni, Se, Ti, Zn) + Pesticides						<input checked="" type="checkbox"/> Grab <input type="checkbox"/> Composite <input type="checkbox"/> Modified <input type="checkbox"/> Other:	Water <input checked="" type="checkbox"/> Soil <input type="checkbox"/> Organic <input type="checkbox"/> Sludge <input type="checkbox"/> Other:	1L amber Cubitainer 2 oz glass 8 oz glass VOA vial Encore Other:	H ₂ SO ₄ HNO ₃ NAOH HCL 4° C (None) Disinfected Other:
For Lab Use Only	Time: 1348	D.O	Flow	pH	Spec. Cond.	Temp.	Other:				
0502765 (Sample D)	3/7/05	Total metals (same as #0502629)						<input checked="" type="checkbox"/> Grab <input type="checkbox"/> Composite <input type="checkbox"/> Modified <input type="checkbox"/> Other:	Water <input checked="" type="checkbox"/> Soil <input type="checkbox"/> Organic <input type="checkbox"/> Sludge <input type="checkbox"/> Other:	1L amber Cubitainer 2 oz glass 8 oz glass VOA vial Encore Other:	H ₂ SO ₄ HNO ₃ NAOH HCL 4° C (None) Disinfected Other:
For Lab Use Only	Time: 1353	D.O	Flow	pH	Spec. Cond.	Temp.	Other:				
Relinquished By: Hugh Murrell		Received By: Maude S. Thompson						Date: 3-8-05	Time: 1545		
Relinquished By:		Received By:						Date:	Time:		
Relinquished By:		Received By:						Date:	Time:		

Sample I.D. Letter	Site Description			LDPR Code	Job Code
Sample A	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): Tunnel insulation				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):				
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
Sample B	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): Tunnel hallway floor mastic				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):				
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
Sample C	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): Soil boring B-3				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):				
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
Sample D	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): Soil boring B-4				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):				
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
REMARKS:					

**MISSOURI DEPARTMENT OF NATURAL RESOURCES
FIELD SHEET AND CHAIN-OF-CUSTODY RECORD**

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LABORATORY ORDER ID:

Collector's Name: Hugh Murrell								Description of Shipment			
Affiliation: <u>ESP</u> KCRO NERO SERO SLRO SWRO WPP								Shipped-Carrier:			
(circle one) GSRAD HWP Other:								Tape sealed and initialed			
								<input checked="" type="checkbox"/> Hand Delivered			
								No. Of Containers:			
Sample Number	Sample Collected	Analyses						Sample Type	For Lab Use Only		
	Date:								Matrix	Container	Preserved
0502766 (Sample A)	3/7/05	Total Metals (same as #0502629)						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
For Lab Use Only	Time:	D.O	Flow	pH	Spec. Cond.	Temp.	Other:	<input type="checkbox"/> Composite	<input checked="" type="checkbox"/> Soil	Cubitainer	HNO ₃
	1400							<input type="checkbox"/> Modified	Organic	2 oz glass	NAOH
								Other:	Sludge	8 oz glass	HCL
									Other:	VOA vial	4° C(None)
										Encore	Disinfected
										Other:	Other
0502767 (Sample B)	3/7/05	Total Metals (same as #0502629)						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
For Lab Use Only	Time:	D.O	Flow	pH	Spec. Cond.	Temp.	Other:	<input type="checkbox"/> Composite	<input checked="" type="checkbox"/> Soil	Cubitainer	HNO ₃
	1430							<input type="checkbox"/> Modified	Organic	2 oz glass	NAOH
								Other:	Sludge	8 oz glass	HCL
									Other:	VOA vial	4° C(None)
										Encore	Disinfected
										Other:	Other
0502768 (Sample C)	3/7/05	Total Metals (same as #0502629)						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
For Lab Use Only	Time:	D.O	Flow	pH	Spec. Cond.	Temp.	Other:	<input type="checkbox"/> Composite	<input checked="" type="checkbox"/> Soil	Cubitainer	HNO ₃
	1437							<input type="checkbox"/> Modified	Organic	2 oz glass	NAOH
								Other:	Sludge	8 oz glass	HCL
									Other:	VOA vial	4° C(None)
										Encore	Disinfected
										Other:	Other
0502769 (Sample D)	3/7/05	Total Metals (same as #0502629)						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
For Lab Use Only	Time:	D.O	Flow	pH	Spec. Cond.	Temp.	Other:	<input type="checkbox"/> Composite	<input checked="" type="checkbox"/> Soil	Cubitainer	HNO ₃
	1440							<input type="checkbox"/> Modified	Organic	2 oz glass	NAOH
								Other:	Sludge	8 oz glass	HCL
									Other:	VOA vial	4° C(None)
										Encore	Disinfected
										Other:	Other
Relinquished By:		Received By:						Date:	Time:		
Hugh Murrell		T. J. Thompson						3-8-05	1545		
Relinquished By:		Received By:						Date:	Time:		
Relinquished By:		Received By:						Date:	Time:		

Sample I.D. Letter	Site Description		LDPR Code	Job Code
Sample A	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): soil boring B-2			
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):			
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>		
Sample B	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): soil boring B-5, 0-4'			
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):			
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>		
Sample C	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): soil boring B-5, 4-8'			
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):			
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>		
Sample D	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): soil boring B-5, 8-12'			
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):			
	Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>		
REMARKS:				



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LABORATORY ORDER ID: _____

Collector's Name: Hugh Murrell								Description of Shipment					
Affiliation: <input checked="" type="checkbox"/> ESP <input type="checkbox"/> KCRO <input type="checkbox"/> NERO <input type="checkbox"/> SERO <input type="checkbox"/> SLRO <input type="checkbox"/> SWRO <input type="checkbox"/> WPP								Shipped-Carrier: _____					
circle one) <input checked="" type="checkbox"/> GSRAD <input type="checkbox"/> HWP <input type="checkbox"/> Other: _____								Tape sealed and initialed _____					
								<input checked="" type="checkbox"/> Hand Delivered					
								No. Of Containers: _____					
Sample Number	Sample Collected	Analyses						Sample Type	For Lab Use Only				
	Date:							Matrix	Container	Preserved			
0502770 (Sample A)	3/7/05	Total metals (same as #0502629)						<input checked="" type="checkbox"/> Grab <input type="checkbox"/> Composite <input type="checkbox"/> Modified <input type="checkbox"/> Other:	Water <input type="checkbox"/> Soil <input type="checkbox"/> Organic <input type="checkbox"/> Sludge <input type="checkbox"/> Other:	1L amber Cubitainer 2 oz glass 8 oz glass VOA vial Encore Other:	H ₂ SO ₄ HNO ₃ NaOH HCL 4° C (None) Disinfected Other:		
For Lab Use Only	Time: 1446	D.O	Flow	pH	Spec. Cond.	Temp.	Other:						
0502771 (Sample B)	3/7/05	Total metals (same as #0502629)						<input checked="" type="checkbox"/> Grab <input type="checkbox"/> Composite <input type="checkbox"/> Modified <input type="checkbox"/> Other:	Water <input checked="" type="checkbox"/> Soil <input type="checkbox"/> Organic <input type="checkbox"/> Sludge <input type="checkbox"/> Other:	1L amber Cubitainer 2 oz glass 8 oz glass VOA vial Encore Other:	H ₂ SO ₄ HNO ₃ NaOH HCL 4° C (None) Disinfected Other:		
For Lab Use Only	Time: 1449	D.O	Flow	pH	Spec. Cond.	Temp.	Other:						
0502772 (Sample C)	3/7/05	Total metals (same as #0502629)						<input checked="" type="checkbox"/> Grab <input type="checkbox"/> Composite <input type="checkbox"/> Modified <input type="checkbox"/> Other:	Water <input checked="" type="checkbox"/> Soil <input type="checkbox"/> Organic <input type="checkbox"/> Sludge <input type="checkbox"/> Other:	1L amber Cubitainer 2 oz glass 8 oz glass VOA vial Encore Other:	H ₂ SO ₄ HNO ₃ NaOH HCL 4° C (None) Disinfected Other:		
For Lab Use Only	Time: 1454	D.O	Flow	pH	Spec. Cond.	Temp.	Other:						
0502773 (Sample D)	3/7/05	Total metals (same as #0502629) + Explosives						<input checked="" type="checkbox"/> Grab <input type="checkbox"/> Composite <input type="checkbox"/> Modified <input type="checkbox"/> Other:	Water <input checked="" type="checkbox"/> Soil <input type="checkbox"/> Organic <input type="checkbox"/> Sludge <input type="checkbox"/> Other:	1L amber Cubitainer 2 oz glass 8 oz glass VOA vial Encore Other:	H ₂ SO ₄ HNO ₃ NaOH HCL 4° C (None) Disinfected Other:		
For Lab Use Only	Time: 1455	D.O	Flow	pH	Spec. Cond.	Temp.	Other:						
Relinquished By: Hugh Murrell		Received By: Maria Thompson						Date: 3-8-05	Time: 1545				
Relinquished By:		Received By:						Date:	Time:				
Relinquished By:		Received By:						Date:	Time:				

Sample I.D. Letter	Site Description			LDPR Code	Job Code
Sample A	Facility ID:	Site/Study Name:	County:	QEBWN	NJ01SLOP
		SLOP	St. Louis City		
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.):				
	Soil boring B-1, 0-4'				
GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):					
Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>					
Sample B	Facility ID:	Site/Study Name:	County:	QEBWN	NJ01SLOP
		SLOP	St. Louis City		
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.):				
	Soil boring B-1, 4-8'				
GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):					
Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>					
Sample C	Facility ID:	Site/Study Name:	County:	QEBWN	NJ01SLOP
		SLOP	St. Louis City		
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.):				
	Soil boring B-1, 8-12'				
GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):					
Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>					
Sample D	Facility ID:	Site/Study Name:	County:	QEBWN	NJ01SLOP
		SLOP	St. Louis City		
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.):				
	Surface; Vault entrance				
GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only):					
Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>					
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LABORATORY ORDER ID: _____

Collector's Name: Hugh Murrell								Description of Shipment			
Please Print) Affiliation: ESP KCRO NERO SERO SLRO SWRO WPP								Shipped-Carrier: _____			
Circle one) GSRAD HWP Other: _____								Tape sealed and initialed _____			
								Hand Delivered _____ No. Of Containers: _____			
Sample Number	Sample Collected	Analyses						Sample Type	For Lab Use Only		
	Date:								Matrix:	Container	Preserved
0502774 (Sample A)	3/7/05	Total metals (same as #0502629) + Explosives						<input checked="" type="checkbox"/> Grab <input type="checkbox"/> Composite <input type="checkbox"/> Modified Other: _____	<input type="checkbox"/> Water <input checked="" type="checkbox"/> Soil <input type="checkbox"/> Organic <input type="checkbox"/> Sludge Other: _____	1L amber Cubitainer 2 oz glass 2 8 oz glass VOA vial Encore Other: _____	H ₂ SO ₄ HNO ₃ NaOH HCL 2 4° C (None) Disinfected Other: _____
For Lab Use Only	Time: 1500	D.O.	Flow	pH	Spec. Cond.	Temp.	Other: _____				
0502775 (Sample B)	3/7/05	Pesticides						<input checked="" type="checkbox"/> Grab <input type="checkbox"/> Composite <input type="checkbox"/> Modified Other: _____	<input type="checkbox"/> Water <input checked="" type="checkbox"/> Soil <input type="checkbox"/> Organic <input type="checkbox"/> Sludge Other: _____	1L amber Cubitainer 2 oz glass 2 8 oz glass VOA vial Encore Other: _____	H ₂ SO ₄ HNO ₃ NaOH HCL 2 4° C (None) Disinfected Other: _____
For Lab Use Only	Time: 1505	D.O.	Flow	pH	Spec. Cond.	Temp.	Other: _____				
0502776 (Sample C)	3/7/05	Total metals (same as #0502629) + Explosives						<input checked="" type="checkbox"/> Grab <input type="checkbox"/> Composite <input type="checkbox"/> Modified Other: _____	<input type="checkbox"/> Water <input type="checkbox"/> Soil <input type="checkbox"/> Organic <input type="checkbox"/> Sludge <input checked="" type="checkbox"/> Other: <i>wipe</i>	1L amber Cubitainer 2 oz glass 2 8 oz glass VOA vial Encore Other: _____	H ₂ SO ₄ HNO ₃ NaOH HCL 2 4° C (None) Disinfected Other: _____
For Lab Use Only	Time: 1519	D.O.	Flow	pH	Spec. Cond.	Temp.	Other: _____				
0502777 (Sample D)	3/7/05	Total metals (same as #0502629) + Explosives, and Penterythritol Tetranitrate (PETN)						<input type="checkbox"/> Grab <input type="checkbox"/> Composite <input type="checkbox"/> Modified Other: _____	<input type="checkbox"/> Water <input type="checkbox"/> Soil <input type="checkbox"/> Organic <input type="checkbox"/> Sludge <input checked="" type="checkbox"/> Other: <i>wipe</i>	1L amber Cubitainer 2 oz glass 3 8 oz glass VOA vial Encore Other: _____	H ₂ SO ₄ HNO ₃ NaOH HCL 3 4° C (None) Disinfected Other: _____
For Lab Use Only	Time: 1530	D.O.	Flow	pH	Spec. Cond.	Temp.	Other: _____				
Relinquished By: <i>Hugh Murrell</i>		Received By: <i>Manda S. Thompson</i>						Date: 3-8-05	Time: 1545		
Relinquished By: _____		Received By: _____						Date: _____	Time: _____		
Relinquished By: _____		Received By: _____						Date: _____	Time: _____		

Sample I.D. Letter	Site Description			LDPR Code	Job Code
Sample A	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): surface soil, bunker east of vault				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only): Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
Sample B	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): surface soil, east end of building				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only): Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
Sample C	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): concrete bunker wipe sample				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only): Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
Sample D	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): Firing Point; T1				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only): Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
REMARKS:					

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FIELD SHEET AND CHAIN-OF-CUSTODY RECORD

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LABORATORY ORDER ID: _____

Collector's Name: Hugh Murrell								Description of Shipment			
Please Print) Affiliation: ESP KCRO NERO SERO SLRO SWRO WPP								Shipped-Carrier: _____			
circle one) GSRAD HWP Other: _____								Tape sealed and initialed _____			
								Hand Delivered _____ No. Of Containers: _____			
Sample Number	Sample Collected	Analyses						Sample Type	For Lab Use Only		
	Date:								Matrix	Container	Preserved
0502778 (Sample A)	3/7/05	Total Metals (same as #0502629) + Explosives + Pentachloro-1,3,5-trinitrobenzene (PETN)						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
For Lab Use Only	Time: 1530	D.O.	Flow	pH	Spec. Cond.	Temp.	Other:	<input type="checkbox"/> Composite	Soil	Cubitainer	HNO ₃
								<input type="checkbox"/> Modified	Organic	2 oz glass	NAOH
								Other:	Sludge	3 8 oz glass	HCL
									<input checked="" type="checkbox"/> Other: Wipe	VOA vial	3 4° C (None)
										Encore	Disinfected
										Other:	Other
0502779 (Sample B)	3/7/05	Total Metals (same as #0502629) + Explosives + PETN						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
For Lab Use Only	Time: 1540	D.O.	Flow	pH	Spec. Cond.	Temp.	Other:	<input type="checkbox"/> Composite	Soil	Cubitainer	HNO ₃
								<input type="checkbox"/> Modified	Organic	2 oz glass	NAOH
								Other:	Sludge	3 8 oz glass	HCL
									<input checked="" type="checkbox"/> Other: Wipe	VOA vial	3 4° C (None)
										Encore	Disinfected
										Other:	Other
0502780 (Sample C)	3/7/05	Total Metals (same as #0502629) + Explosives + PETN						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
For Lab Use Only	Time: 1550	D.O.	Flow	pH	Spec. Cond.	Temp.	Other:	<input type="checkbox"/> Composite	Soil	Cubitainer	HNO ₃
								<input type="checkbox"/> Modified	Organic	2 oz glass	NAOH
								Other:	Sludge	3 8 oz glass	HCL
									<input checked="" type="checkbox"/> Other: Wipe	VOA vial	3 4° C (None)
										Encore	Disinfected
										Other:	Other
0502781 (Sample D)	3/7/05	Total Metals (same as #0502629) + Phosphorous, Dichlorate, Magnesium						<input checked="" type="checkbox"/> Grab	Water	1L amber	H ₂ SO ₄
For Lab Use Only	Time: 1600	D.O.	Flow	pH	Spec. Cond.	Temp.	Other:	<input type="checkbox"/> Composite	Soil	Cubitainer	HNO ₃
								<input type="checkbox"/> Modified	Organic	2 oz glass	NAOH
								Other:	Sludge	3 8 oz glass	HCL
									<input checked="" type="checkbox"/> Other: Wipe	VOA vial	3 4° C (None)
										Encore	Disinfected
										Other:	Other
Relinquished By: Hugh Murrell		Received By: Paul L Thompson						Date: 3-8-05	Time: 1545		
Relinquished By: _____		Received By: _____						Date: _____	Time: _____		
Relinquished By: _____		Received By: _____						Date: _____	Time: _____		

Sample I.D. Letter	Site Description						LDPR Code	Job Code	
Sample A	Facility ID:		Site/Study Name: SLOP			County: St-Louis City		QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): DUPLICATE								
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only): Lat. [][] . [][][][][][][] Long. — [][] . [][][][][][][]								
Sample B	Facility ID:		Site/Study Name: SLOP			County: St-Louis City		QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): Firing Point ; T2								
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only): Lat. [][] . [][][][][][][] Long. — [][] . [][][][][][][]								
Sample C	Facility ID:		Site/Study Name: SLOP			County: St-Louis City		QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): Firing Point ; T3								
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only): Lat. [][] . [][][][][][][] Long. — [][] . [][][][][][][]								
Sample D	Facility ID:		Site/Study Name: SLOP			County: St-Louis City		QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): Point of impact ; Skipped tunnel								
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only): Lat. [][] . [][][][][][][] Long. — [][] . [][][][][][][]								
REMARKS:									



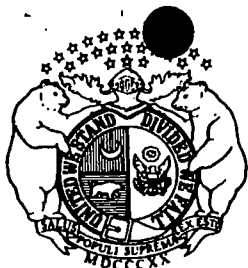
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LABORATORY ORDER ID: _____

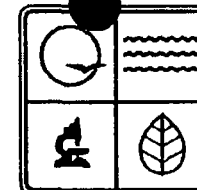
Collector's Name: Hugh Murrell								Description of Shipment			
(Please Print) Affiliation: <u>ESP</u> KCRO NERO SERO SLRO SWRO WPP circle one) GSRAD HWP Other: _____								Shipped-Carrier: _____ Tape sealed and initialed <input checked="" type="checkbox"/> Hand Delivered			
Sample Number		Sample Collected	Analyses					Sample Type	For Lab Use Only		
		Date:							Matrix	Container	Preserved
0502782 (Sample A)		3/7/05	Total Metals (same as #0502629) + Phosphorous, Perchlorate, Magnesium					<input checked="" type="checkbox"/> Grab <input type="checkbox"/> Composite <input type="checkbox"/> Modified Other: _____	Water Soil Organic Sludge <input checked="" type="checkbox"/> Other: <u>Wipe</u>	1L amber Cubitainer 2 oz glass <u>4</u> 8 oz glass VOA vial Encore Other: _____	H ₂ SO ₄ HNO ₃ NAOH HCL <u>4</u> 4° C (None) Disinfected Other: _____
For Lab Use Only		Time: 1610	D.O.	Flow	pH	Spec. Cond.	Temp.	Other: _____			
0502783 (Sample B)		3/7/05	Total Metals (same as #0502629) Phosphorous, Perchlorate, Magnesium					<input checked="" type="checkbox"/> Grab <input type="checkbox"/> Composite <input type="checkbox"/> Modified Other: _____	Water Soil Organic Sludge <input checked="" type="checkbox"/> Other: <u>Wipe</u>	1L amber Cubitainer 2 oz glass <u>4</u> 8 oz glass VOA vial Encore Other: _____	H ₂ SO ₄ HNO ₃ NAOH HCL <u>4</u> 4° C (None) Disinfected Other: _____
For Lab Use Only		Time: 1615	D.O.	Flow	pH	Spec. Cond.	Temp.	Other: _____			
0502784 (Sample C)		3/7/05	same as #0502783					<input checked="" type="checkbox"/> Grab <input type="checkbox"/> Composite <input type="checkbox"/> Modified Other: _____	Water Soil Organic Sludge <input checked="" type="checkbox"/> Other: <u>Wipe</u>	1L amber Cubitainer 2 oz glass <u>4</u> 8 oz glass VOA vial Encore Other: _____	H ₂ SO ₄ HNO ₃ NAOH HCL <u>4</u> 4° C (None) Disinfected Other: _____
For Lab Use Only		Time: 1625	D.O.	Flow	pH	Spec. Cond.	Temp.	Other: _____			
0502785 (Sample D)		3/7/05	same as #0502783					<input checked="" type="checkbox"/> Grab <input type="checkbox"/> Composite <input type="checkbox"/> Modified Other: _____	Water Soil Organic Sludge <input checked="" type="checkbox"/> Other: <u>Wipe</u>	1L amber Cubitainer 2 oz glass <u>4</u> 8 oz glass VOA vial Encore Other: _____	H ₂ SO ₄ HNO ₃ NAOH HCL <u>4</u> 4° C (None) Disinfected Other: _____
For Lab Use Only		Time: 1635	D.O.	Flow	pH	Spec. Cond.	Temp.	Other: _____			
Relinquished By: <u>Hugh Murrell</u>			Received By: <u>Manda Thompson</u>			Date: <u>3-8-05</u>			Time: <u>1545</u>		
Relinquished By: _____			Received By: _____			Date: _____			Time: _____		
Relinquished By: _____			Received By: _____			Date: _____			Time: _____		

Sample I.D. Letter	Site Description			LDPR Code	Job Code
Sample A	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): Vent; T2				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only): Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
Sample B	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): Point of impact; T1				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only): Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
Sample C	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): Short tunnel wipe				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only): Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
Sample D	Facility ID:	Site/Study Name: SLOP	County: St. Louis City	QEBWN	NJ01SLOP
	Sample Comment (briefly describe where and how the sample was collected, station number, sample type, etc.): Long tunnel wipe				
	GPS Coordinates (Record Coordinates in Decimal Degree using Datum NAD 83 Only): Lat. <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Long. — <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
REMARKS:					



Missouri Department of Natural Resources

Environmental Services Program



Order ID: 050309001

Report Date: 5/20/2005

Order Comment:

Program, Contact: HWP, Christine O'Keefe

LDPR: QEBWN/NJ01SLOP

RECEIVED

MAY 25 2005

Hazardous Waste Program
MO Dept. of Natural Resources

Sample: 050309001-01

Facility ID:

Site:

SLOP

Customer #: 0502615

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 11:33 AM

Matrix: Solid/Organic/Misc

Sample Comment: Wall sample A1 south

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Lead-Total	Lead	186000000	09,17	ug/kg		SW 846 6010B (ICP)

Sample: 050309001-02

Facility ID:

Site:

SLOP

Customer #: 0502616

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 11:45 AM

Matrix: Solid/Organic/Misc

Sample Comment: Wall sample A1 east

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Lead-Total	Lead	13700000	09,17	ug/kg		SW 846 6010B (ICP)

Sample: 050309001-03

Facility ID:

Site:

SLOP

Customer #: 0502617

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 11:55 AM

Matrix: Solid/Organic/Misc

Sample Comment: Wall sample B1 south

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Lead-Total	Lead	76200000	09,17	ug/kg		SW 846 6010B (ICP)



Sample: 050309001-04

Facility ID:

Site:

SLOP

Customer # : 0502618

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 12:03 PM

Matrix: Solid/Organic/Misc

Sample Comment: Wall sample B1 north

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Lead-Total	Lead	16600000	09,17	ug/kg		SW 846 6010B (ICP)

Sample: 050309001-05

Facility ID:

Site:

SLOP

Customer # : 0502619

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 12:15 PM

Matrix: Solid/Organic/Misc

Sample Comment: Wall sample C1 east

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Lead-Total	Lead	22400000	09,17	ug/kg		SW 846 6010B (ICP)

Sample: 050309001-06

Facility ID:

Site:

SLOP

Customer # : 0502620

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 12:20 PM

Matrix: Solid/Organic/Misc

Sample Comment: Wall sample C1 west

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Lead-Total	Lead	11500000	09,17	ug/kg		SW 846 6010B (ICP)

Sample: 050309001-07

Facility ID:

Site:

SLOP

Customer # : 0502621

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 12:25 PM

Matrix: Solid/Organic/Misc

Sample Comment: ACM pipe wrap A1 south

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Asbestos	Asbestos	Detected	04			PLM
< 1% Chrysotile, < 1% Amosite						



Sample: 050309001-08**Facility ID:****Site:**

SLOP

Customer # : 0502622**County:** St. Louis City**Collect Date:** 3/7/2005**Collector:** Hugh Murrell**Affiliation:** ESP**Collect Time:** 12:30 PM**Matrix:** Solid/Organic/Misc**Sample Comment:** ACM tile B1 north end

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Asbestos	Asbestos	Not Detected	04			PLM

Sample: 050309001-09**Facility ID:****Site:**

SLOP

Customer # : 0502623**County:** St. Louis City**Collect Date:** 3/7/2005**Collector:** Hugh Murrell**Affiliation:** ESP**Collect Time:** 12:37 PM**Matrix:** Solid/Organic/Misc**Sample Comment:** ACM pipe basement

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Asbestos	Asbestos	Detected	04			PLM
	40% Chrysotile, 2% Amosite					

Sample: 050309001-10**Facility ID:****Site:**

SLOP

Customer # : 0502624**County:** St. Louis City**Collect Date:** 3/7/2005**Collector:** Hugh Murrell**Affiliation:** ESP**Collect Time:** 12:42 PM**Matrix:** Solid/Organic/Misc**Sample Comment:** ACM pipe basement bathroom

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Asbestos	Asbestos	Detected	04			PLM
	< 1% Chrysotile					

Sample: 050309001-11**Facility ID:****Site:**

SLOP

Customer # : 0502625**County:** St. Louis City**Collect Date:** 3/7/2005**Collector:** Hugh Murrell**Affiliation:** ESP**Collect Time:** 12:45 PM**Matrix:** Solid/Organic/Misc**Sample Comment:** ACM transite N end of building

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Asbestos	Asbestos	Detected	04			PLM
	30% Chrysotile					



Sample: 050309001-12**Facility ID:****Site:**

SLOP

Customer # : 0502626**County:** St. Louis City**Collect Date:** 3/7/2005**Collector:** Hugh Murrell**Affiliation:** ESP**Collect Time:** 12:49 PM**Matrix:** Solid/Organic/Misc**Sample Comment:** ACM ceiling tile B1

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Asbestos	Asbestos	Not Detected	04			PLM

Sample: 050309001-13**Facility ID:****Site:**

SLOP

Customer # : 0502627**County:** St. Louis City**Collect Date:** 3/7/2005**Collector:** Hugh Murrell**Affiliation:** ESP**Collect Time:** 12:52 PM**Matrix:** Solid/Organic/Misc**Sample Comment:** Tunnel insulation

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Asbestos	Asbestos	Detected	04			PLM
	40% Chrysotile, < 1% Amosite					

Sample: 050309001-14**Facility ID:****Site:**

SLOP

Customer # : 0502628**County:** St. Louis City**Collect Date:** 3/7/2005**Collector:** Hugh Murrell**Affiliation:** ESP**Collect Time:** 12:55 PM**Matrix:** Solid/Organic/Misc**Sample Comment:** Tunnel hallway floor mastic

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Asbestos	Asbestos	Detected	04			PLM
	5% Chrysotile					

Sample: 050309001-15**Facility ID:****Site:**

SLOP

Customer # : 0502629**County:** St. Louis City**Collect Date:** 3/7/2005**Collector:** Hugh Murrell**Affiliation:** ESP**Collect Time:** 1:48 PM**Matrix:** Soils**Sample Comment:** Soil boring B-3

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony-Total	Antimony	1930	17, 05	ug/kg		SW 846 6010B (ICP)
Arsenic-Total	Arsenic	8090	17	ug/kg		SW 846 6010B (ICP)
Beryllium-Total	Beryllium	535	17	ug/kg		SW 846 6010B (ICP)
Cadmium-Total	Cadmium	1080	17	ug/kg		SW 846 6010B (ICP)
Copper-Total	Copper	43700	17	ug/kg		SW 846 6010B (ICP)
Lead-Total	Lead	296000	17	ug/kg		SW 846 6010B (ICP)



Sample: 050309001-15

Facility ID:

Site:

SLOP

Customer # : 0502629

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 1:48 PM

Matrix: Soils

Sample Comment: Soil boring B-3

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Mercury-Total	Mercury	191	17	ug/kg		EPA 245.1
Nickel-Total	Nickel	16900	17	ug/kg		SW 846 6010B (ICP)
Organochlorine Pesticides	4,4-DDD	125	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	4,4-DDE	125	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	4,4-DDT	125	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Aldrin	125	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	alpha-BHC	125	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	beta-BHC	125	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Chlordane	1250	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	delta-BHC	125	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Dieldrin	125	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Endosulfan I	125	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Endosulfan II	125	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Endosulfan sulfate	125	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Endrin	125	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Endrin aldehyde	125	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	gamma-BHC (Lindane)	125	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Heptachlor	125	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Heptachlor Epoxide	125	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Methoxychlor	125	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Toxaphene	1250	09, ND	ug/kg	Q030905-01pest	8081A
Percent Moisture	Percent Moisture	19.1		%		Not Applicable
Selenium-Total	Selenium	500	17, ND	ug/kg		SW 846 6010B (ICP)
Thallium-Total	Thallium	626	17, 05	ug/kg		SW 846 6010B (ICP)
Zinc-Total	Zinc	171000	17	ug/kg		SW 846 6010B (ICP)

Sample: 050309001-16

Facility ID:

Site:

SLOP

Customer # : 0502765

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 1:53 PM

Matrix: Soils

Sample Comment: Soil boring B-4

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony-Total	Antimony	1690	06, 17, 05	ug/kg		SW 846 6010B (ICP)
Arsenic-Total	Arsenic	11100	17	ug/kg		SW 846 6010B (ICP)



Sample: 050309001-16**Facility ID:****Site:**

SLOP

Customer # : 0502765**County:** St. Louis City**Collect Date:** 3/7/2005**Collector:** Hugh Murrell**Affiliation:** ESP**Collect Time:** 1:53 PM**Matrix:** Soils**Sample Comment:** Soil boring B-4

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Beryllium-Total	Beryllium	703	17	ug/kg		SW 846 6010B (ICP)
Cadmium-Total	Cadmium	267	17	ug/kg		SW 846 6010B (ICP)
Copper-Total	Copper	15000	17	ug/kg		SW 846 6010B (ICP)
Lead-Total	Lead	13900	06, 17	ug/kg		SW 846 6010B (ICP)
Mercury-Total	Mercury	53.0	17	ug/kg		EPA 245.1
Nickel-Total	Nickel	28200	06, 17	ug/kg		SW 846 6010B (ICP)
Percent Moisture	Percent Moisture	22.1		%		Not Applicable
Selenium-Total	Selenium	566	17, 05	ug/kg		SW 846 6010B (ICP)
Thallium-Total	Thallium	1520	06, 17, 05	ug/kg		SW 846 6010B (ICP)
Zinc-Total	Zinc	59500	17	ug/kg		SW 846 6010B (ICP)

Sample: 050309001-17**Facility ID:****Site:**

SLOP

Customer # : 0502766**County:** St. Louis City**Collect Date:** 3/7/2005**Collector:** Hugh Murrell**Affiliation:** ESP**Collect Time:** 2:00 PM**Matrix:** Soils**Sample Comment:** Soil boring B-2

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony-Total	Antimony	1120	17, 05	ug/kg		SW 846 6010B (ICP)
Arsenic-Total	Arsenic	8030	17	ug/kg		SW 846 6010B (ICP)
Beryllium-Total	Beryllium	521	17	ug/kg		SW 846 6010B (ICP)
Cadmium-Total	Cadmium	197	17	ug/kg		SW 846 6010B (ICP)
Copper-Total	Copper	13800	17	ug/kg		SW 846 6010B (ICP)
Lead-Total	Lead	9310	17	ug/kg		SW 846 6010B (ICP)
Mercury-Total	Mercury	32.3	17	ug/kg		EPA 245.1
Nickel-Total	Nickel	16100	17	ug/kg		SW 846 6010B (ICP)
Percent Moisture	Percent Moisture	21.6		%		Not Applicable
Selenium-Total	Selenium	500	17, ND	ug/kg		SW 846 6010B (ICP)
Thallium-Total	Thallium	527	17, 05	ug/kg		SW 846 6010B (ICP)
Zinc-Total	Zinc	45300	17	ug/kg		SW 846 6010B (ICP)



Sample: 050309001-18

Facility ID:

Site:

SLOP

Customer # : 0502767

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 2:30 PM

Matrix: Soils

Sample Comment: Soil boring B-5, 0-4'

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony-Total	Antimony	784	17, 05	ug/kg		SW 846 6010B (ICP)
Arsenic-Total	Arsenic	6010	17	ug/kg		SW 846 6010B (ICP)
Beryllium-Total	Beryllium	380	17	ug/kg		SW 846 6010B (ICP)
Cadmium-Total	Cadmium	594	17	ug/kg		SW 846 6010B (ICP)
Copper-Total	Copper	45200	17	ug/kg		SW 846 6010B (ICP)
Lead-Total	Lead	82300	17	ug/kg		SW 846 6010B (ICP)
Mercury-Total	Mercury	73.9	17	ug/kg		EPA 245.1
Nickel-Total	Nickel	11400	17	ug/kg		SW 846 6010B (ICP)
Percent Moisture	Percent Moisture	17.1		%		Not Applicable
Selenium-Total	Selenium	500	17, ND	ug/kg		SW 846 6010B (ICP)
Thallium-Total	Thallium	500	17, ND	ug/kg		SW 846 6010B (ICP)
Zinc-Total	Zinc	178000	17	ug/kg		SW 846 6010B (ICP)

Sample: 050309001-19

Facility ID:

Site:

SLOP

Customer # : 0502768

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 2:37 PM

Matrix: Soils

Sample Comment: Soil boring B-5, 4-8'

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony-Total	Antimony	500	17, ND	ug/kg		SW 846 6010B (ICP)
Arsenic-Total	Arsenic	2010	17, 05	ug/kg		SW 846 6010B (ICP)
Beryllium-Total	Beryllium	67.3	17	ug/kg		SW 846 6010B (ICP)
Cadmium-Total	Cadmium	78.2	17	ug/kg		SW 846 6010B (ICP)
Copper-Total	Copper	2060	17	ug/kg		SW 846 6010B (ICP)
Lead-Total	Lead	2880	17	ug/kg		SW 846 6010B (ICP)
Mercury-Total	Mercury	9.53	17, 05	ug/kg		EPA 245.1
Nickel-Total	Nickel	6720	17	ug/kg		SW 846 6010B (ICP)
Percent Moisture	Percent Moisture	1.6		%		Not Applicable
Selenium-Total	Selenium	500	17, ND	ug/kg		SW 846 6010B (ICP)
Thallium-Total	Thallium	500	17, ND	ug/kg		SW 846 6010B (ICP)
Zinc-Total	Zinc	17100	17	ug/kg		SW 846 6010B (ICP)



Sample: 050309001-20

Facility ID:

Site:

SLOP

Customer # : 0502769

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 2:40 PM

Matrix: Soils

Sample Comment: Soil boring B-5, 8-12'

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony-Total	Antimony	500	17, ND	ug/kg		SW 846 6010B (ICP)
Arsenic-Total	Arsenic	5220	17	ug/kg		SW 846 6010B (ICP)
Beryllium-Total	Beryllium	457	17	ug/kg		SW 846 6010B (ICP)
Cadmium-Total	Cadmium	187	17	ug/kg		SW 846 6010B (ICP)
Copper-Total	Copper	11200	17	ug/kg		SW 846 6010B (ICP)
Lead-Total	Lead	6970	17	ug/kg		SW 846 6010B (ICP)
Mercury-Total	Mercury	37.8	17	ug/kg		EPA 245.1
Nickel-Total	Nickel	14100	17	ug/kg		SW 846 6010B (ICP)
Percent Moisture	Percent Moisture	20.0		%		Not Applicable
Selenium-Total	Selenium	500	17, ND	ug/kg		SW 846 6010B (ICP)
Thallium-Total	Thallium	500	17, ND	ug/kg		SW 846 6010B (ICP)
Zinc-Total	Zinc	36400	17	ug/kg		SW 846 6010B (ICP)

Sample: 050309001-21

Facility ID:

Site:

SLOP

Customer # : 0502770

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 2:46 PM

Matrix: Soils

Sample Comment: Soil boring B-1, 0-4'

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony-Total	Antimony	1910	17, 05	ug/kg		SW 846 6010B (ICP)
Arsenic-Total	Arsenic	7370	17	ug/kg		SW 846 6010B (ICP)
Beryllium-Total	Beryllium	583	17	ug/kg		SW 846 6010B (ICP)
Cadmium-Total	Cadmium	326	17	ug/kg		SW 846 6010B (ICP)
Copper-Total	Copper	16800	17	ug/kg		SW 846 6010B (ICP)
Lead-Total	Lead	28600	17	ug/kg		SW 846 6010B (ICP)
Mercury-Total	Mercury	47.5	17	ug/kg		EPA 245.1
Nickel-Total	Nickel	18100	17	ug/kg		SW 846 6010B (ICP)
Percent Moisture	Percent Moisture	19.6		%		Not Applicable
Selenium-Total	Selenium	500	17, ND	ug/kg		SW 846 6010B (ICP)
Thallium-Total	Thallium	500	17, ND	ug/kg		SW 846 6010B (ICP)
Zinc-Total	Zinc	62400	17	ug/kg		SW 846 6010B (ICP)



Sample: 050309001-22

Facility ID:

Site:

SLOP

Customer # : 0502771

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 2:49 PM

Matrix: Soils

Sample Comment: Soil boring B-1, 4-8'

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony-Total	Antimony	1090	17, 05	ug/kg		SW 846 6010B (ICP)
Arsenic-Total	Arsenic	7630	17	ug/kg		SW 846 6010B (ICP)
Beryllium-Total	Beryllium	522	17	ug/kg		SW 846 6010B (ICP)
Cadmium-Total	Cadmium	98.7	17	ug/kg		SW 846 6010B (ICP)
Copper-Total	Copper	14200	17	ug/kg		SW 846 6010B (ICP)
Lead-Total	Lead	13500	17	ug/kg		SW 846 6010B (ICP)
Mercury-Total	Mercury	42.4	17	ug/kg		EPA 245.1
Nickel-Total	Nickel	14600	17	ug/kg		SW 846 6010B (ICP)
Percent Moisture	Percent Moisture	18.7		%		Not Applicable
Selenium-Total	Selenium	500	17, ND	ug/kg		SW 846 6010B (ICP)
Thallium-Total	Thallium	500	17, ND	ug/kg		SW 846 6010B (ICP)
Zinc-Total	Zinc	52800	17	ug/kg		SW 846 6010B (ICP)

Sample: 050309001-23

Facility ID:

Site:

SLOP

Customer # : 0502772

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 2:54 PM

Matrix: Soils

Sample Comment: Soil boring B-1, 8-12'

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony-Total	Antimony	2270	17, 05	ug/kg		SW 846 6010B (ICP)
Arsenic-Total	Arsenic	9770	17	ug/kg		SW 846 6010B (ICP)
Beryllium-Total	Beryllium	577	17	ug/kg		SW 846 6010B (ICP)
Cadmium-Total	Cadmium	3460	17	ug/kg		SW 846 6010B (ICP)
Copper-Total	Copper	53600	17	ug/kg		SW 846 6010B (ICP)
Lead-Total	Lead	1390000	17	ug/kg		SW 846 6010B (ICP)
Mercury-Total	Mercury	164	17	ug/kg		EPA 245.1
Nickel-Total	Nickel	19600	17	ug/kg		SW 846 6010B (ICP)
Percent Moisture	Percent Moisture	30.5		%		Not Applicable
Selenium-Total	Selenium	500	17, ND	ug/kg		SW 846 6010B (ICP)
Thallium-Total	Thallium	568	17, 05	ug/kg		SW 846 6010B (ICP)
Zinc-Total	Zinc	1520000	17	ug/kg		SW 846 6010B (ICP)



Sample: 050309001-24**Facility ID:****Site:**

SLOP

Customer # : 0502773**County:** St. Louis City**Collect Date:** 3/7/2005**Collector:** Hugh Murrell**Affiliation:** ESP**Collect Time:** 2:55 PM**Matrix:** Soils**Sample Comment:** Surface; vault entrance

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony-Total	Antimony	1300	17, 05	ug/kg		SW 846 6010B (ICP)
Arsenic-Total	Arsenic	7900	17	ug/kg		SW 846 6010B (ICP)
Beryllium-Total	Beryllium	472	17	ug/kg		SW 846 6010B (ICP)
Cadmium-Total	Cadmium	136	17	ug/kg		SW 846 6010B (ICP)
Copper-Total	Copper	12000	17	ug/kg		SW 846 6010B (ICP)
Lead-Total	Lead	8870	17	ug/kg		SW 846 6010B (ICP)
Mercury-Total	Mercury	37.8	17	ug/kg		EPA 245.1
Nickel-Total	Nickel	15100	17	ug/kg		SW 846 6010B (ICP)
Nitroaromatics	1,3,5-Trinitrobenzene	350	ND,04	ug/kg		8330
Nitroaromatics	1,3-Dinitrobenzene	350	ND,04	ug/kg		8330
Nitroaromatics	2,4,6-Trinitrotoluene	350	ND,04	ug/kg		8330
Nitroaromatics	2,4-Dinitrotoluene	350	ND,04	ug/kg		8330
Nitroaromatics	2,6-Dinitrotoluene	350	ND,04	ug/kg		8330
Nitroaromatics	2-Amino-4,6-dinitrotoluene	350	ND,04	ug/kg		8330
Nitroaromatics	2-Nitrotoluene	500	ND,04	ug/kg		8330
Nitroaromatics	3-Nitrotoluene	500	ND,04	ug/kg		8330
Nitroaromatics	4-Amino-2,6-dinitrotoluene	350	ND,04	ug/kg		8330
Nitroaromatics	4-Nitrotoluene	500	ND,04	ug/kg		8330
Nitroaromatics	HMX	500	ND,04	ug/kg		8330
Nitroaromatics	Nitrobenzene	500	ND,04	ug/kg		8330
Nitroaromatics	RDX	500	ND,04	ug/kg		8330
Nitroaromatics	Tetryl	350	ND,04	ug/kg		8330
Percent Moisture	Percent Moisture	21.0		%		Not Applicable
Selenium-Total	Selenium	500	17, ND	ug/kg		SW 846 6010B (ICP)
Thallium-Total	Thallium	500	17, ND	ug/kg		SW 846 6010B (ICP)
Zinc-Total	Zinc	42200	17	ug/kg		SW 846 6010B (ICP)

Sample: 050309001-25**Facility ID:****Site:**

SLOP

Customer # : 0502774**County:** St. Louis City**Collect Date:** 3/7/2005**Collector:** Hugh Murrell**Affiliation:** ESP**Collect Time:** 3:00 PM**Matrix:** Soils**Sample Comment:** Surface soil, bunker east of vault.

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony-Total	Antimony	1040	17, 05	ug/kg		SW 846 6010B (ICP)



Sample: 050309001-25

Facility ID:

Site:

SLOP

Customer # : 0502774

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 3:00 PM

Matrix: Soils

Sample Comment: Surface soil, bunker east of vault.

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Arsenic-Total	Arsenic	7500	17	ug/kg		SW 846 6010B (ICP)
Beryllium-Total	Beryllium	480	17	ug/kg		SW 846 6010B (ICP)
Cadmium-Total	Cadmium	560	17	ug/kg		SW 846 6010B (ICP)
Copper-Total	Copper	21300	17	ug/kg		SW 846 6010B (ICP)
Lead-Total	Lead	87300	17	ug/kg		SW 846 6010B (ICP)
Mercury-Total	Mercury	94.3	17	ug/kg		EPA 245.1
Nickel-Total	Nickel	15900	17	ug/kg		SW 846 6010B (ICP)
Nitroaromatics	1,3,5-Trinitrobenzene	350	ND,04	ug/kg		8330
Nitroaromatics	1,3-Dinitrobenzene	350	ND,04	ug/kg		8330
Nitroaromatics	2,4,6-Trinitrotoluene	350	ND,04	ug/kg		8330
Nitroaromatics	2,4-Dinitrotoluene	350	ND,04	ug/kg		8330
Nitroaromatics	2,6-Dinitrotoluene	350	ND,04	ug/kg		8330
Nitroaromatics	2-Amino-4,6-dinitrotoluene	350	ND,04	ug/kg		8330
Nitroaromatics	2-Nitrotoluene	500	ND,04	ug/kg		8330
Nitroaromatics	3-Nitrotoluene	500	ND,04	ug/kg		8330
Nitroaromatics	4-Amino-2,6-dinitrotoluene	350	ND,04	ug/kg		8330
Nitroaromatics	4-Nitrotoluene	500	ND,04	ug/kg		8330
Nitroaromatics	HMX	500	ND,04	ug/kg		8330
Nitroaromatics	Nitrobenzene	500	ND,04	ug/kg		8330
Nitroaromatics	RDX	500	ND,04	ug/kg		8330
Nitroaromatics	Tetryl	350	ND,04	ug/kg		8330
Percent Moisture	Percent Moisture	24.4		%		Not Applicable
Selenium-Total	Selenium	500	17, ND	ug/kg		SW 846 6010B (ICP)
Thallium-Total	Thallium	500	17, ND	ug/kg		SW 846 6010B (ICP)
Zinc-Total	Zinc	85800	17	ug/kg		SW 846 6010B (ICP)

Sample: 050309001-26

Facility ID:

Site:

SLOP

Customer # : 0502775

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 3:05 PM

Matrix: Soils

Sample Comment: Surface soil, east end of building.

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Organochlorine Pesticides	4,4-DDD	12500	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	4,4-DDE	12500	09, ND	ug/kg	Q030905-01pest	8081A



Sample: 050309001-26

Facility ID:

Site:

SLOP

Customer # : 0502775

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation:

ESP

Collect Time: 3:05 PM

Matrix: Soils

Sample Comment: Surface soil, east end of building.

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Organochlorine Pesticides	4,4-DDT	12500	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Aldrin	12500	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	alpha-BHC	12500	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	beta-BHC	12500	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Chlordane	1730000		ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	delta-BHC	12500	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Dieldrin	12500	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Endosulfan I	12500	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Endosulfan II	12500	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Endosulfan sulfate	12500	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Endrin	12500	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Endrin aldehyde	12500	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	gamma-BHC (Lindane)	12500	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Heptachlor	12500	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Heptachlor Epoxide	12500	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Methoxychlor	12500	09, ND	ug/kg	Q030905-01pest	8081A
Organochlorine Pesticides	Toxaphene	125000	09, ND	ug/kg	Q030905-01pest	8081A
Percent Moisture	Percent Moisture	19.6		%		Not Applicable

Sample: 050309001-27

Facility ID:

Site:

SLOP

Customer # : 0502776

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation:

ESP

Collect Time: 3:19 PM

Matrix: Wipe

Sample Comment: Concrete bunker wipe sample

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony	Antimony	7200	17	ug/100cm2		SW 846 6020 (ICP-MS)
Arsenic	Arsenic	1700	17	ug/100cm2		SW 846 6020 (ICP-MS)
Beryllium	Beryllium	59.0	17	ug/100cm2		SW 846 6020 (ICP-MS)
Cadmium	Cadmium	2900	17	ug/100cm2		SW 846 6020 (ICP-MS)
Copper	Copper	44000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Iron	Iron	36000000	17	ug/100cm2		SW 846 6010B (ICP)
Lead	Lead	160000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Mercury	Mercury	58.0	17	ug/100cm2		SW 846 - 7471A
Nickel	Nickel	8200	17	ug/100cm2		SW 846 6020 (ICP-MS)



Sample: 050309001-27

Facility ID:

Site:

SLOP

Customer # : 0502776

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 3:19 PM

Matrix: Wipe

Sample Comment: Concrete bunker wipe sample

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Nitroaromatics	1,3,5-Trinitrobenzene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	1,3-Dinitrobenzene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2,4,6-Trinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2,4-Dinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2,6-Dinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2-Amino-4,6-dinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2-Nitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	3-Nitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	4-Amino-2,6-dinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	4-Nitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	HMX	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	Nitrobenzene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	RDX	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	Tetryl	0.50	ND,04	ug/100cm2		8330
Selenium	Selenium	190	17	ug/100cm2		SW 846 6020 (ICP-MS)
Thallium	Thallium	37.0	17	ug/100cm2		SW 846 6020 (ICP-MS)
Zinc	Zinc	180000	17	ug/100cm2		SW 846 6020 (ICP-MS)

Sample: 050309001-28

Facility ID:

Site:

SLOP

Customer # : 0502777

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 3:30 PM

Matrix: Wipe

Sample Comment: Firing point, T1

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony	Antimony	430000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Arsenic	Arsenic	4500	17	ug/100cm2		SW 846 6020 (ICP-MS)
Beryllium	Beryllium	6.40	17	ug/100cm2		SW 846 6020 (ICP-MS)
Cadmium	Cadmium	510	17	ug/100cm2		SW 846 6020 (ICP-MS)
Copper	Copper	8200000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Iron	Iron	210000000	17	ug/100cm2		SW 846 6010B (ICP)
Lead	Lead	6800000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Mercury	Mercury	4700	17	ug/100cm2		SW 846 - 7471A
Nickel	Nickel	68000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Nitroaromatics	1,3,5-Trinitrobenzene	0.50	ND,04	ug/100cm2		8330



Sample: 050309001-28**Facility ID:****Site:**

SLOP

Customer #: 0502777**County:** St. Louis City**Collect Date:** 3/7/2005**Collector:** Hugh Murrell**Affiliation:** ESP**Collect Time:** 3:30 PM**Matrix:** Wipe**Sample Comment:** Firing point, T1

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Nitroaromatics	1,3-Dinitrobenzene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2,4,6-Trinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2,4-Dinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2,6-Dinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2-Amino-4,6-dinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2-Nitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	3-Nitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	4-Amino-2,6-dinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	4-Nitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	HMX	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	Nitrobenzene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	RDX	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	Tetryl	0.50	ND,04	ug/100cm2		8330
Selenium	Selenium	48.0	17	ug/100cm2		SW 846 6020 (ICP-MS)
Thallium	Thallium	11.0	17	ug/100cm2		SW 846 6020 (ICP-MS)
Zinc	Zinc	940000	17	ug/100cm2		SW 846 6020 (ICP-MS)

Sample: 050309001-29**Facility ID:****Site:**

SLOP

Customer #: 0502778**County:** St. Louis City**Collect Date:** 3/7/2005**Collector:** Hugh Murrell**Affiliation:** ESP**Collect Time:** 3:30 PM**Matrix:** Wipe**Sample Comment:** Duplicate

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony	Antimony	470000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Arsenic	Arsenic	5600	17	ug/100cm2		SW 846 6020 (ICP-MS)
Beryllium	Beryllium	7.20	17	ug/100cm2		SW 846 6020 (ICP-MS)
Cadmium	Cadmium	520	17	ug/100cm2		SW 846 6020 (ICP-MS)
Copper	Copper	9600000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Iron	Iron	200000000	17	ug/100cm2		SW 846 6010B (ICP)
Lead	Lead	8500000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Mercury	Mercury	11000	17	ug/100cm2		SW 846 - 7471A
Nickel	Nickel	56000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Nitroaromatics	1,3,5-Trinitrobenzene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	1,3-Dinitrobenzene	0.50	ND,04	ug/100cm2		8330



Sample: 050309001-29**Facility ID:****Site:** SLOP**Customer # : 0502778****County:** St. Louis City**Collect Date:** 3/7/2005**Collector:** Hugh Murrell**Affiliation:** ESP**Collect Time:** 3:30 PM**Matrix:** Wipe**Sample Comment:** Duplicate

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Nitroaromatics	2,4,6-Trinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2,4-Dinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2,6-Dinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2-Amino-4,6-dinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2-Nitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	3-Nitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	4-Amino-2,6-dinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	4-Nitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	HMX	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	Nitrobenzene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	RDX	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	Tetryl	0.50	ND,04	ug/100cm2		8330
Selenium	Selenium	120	17	ug/100cm2		SW 846 6020 (ICP-MS)
Thallium	Thallium	10.0	17	ug/100cm2		SW 846 6020 (ICP-MS)
Zinc	Zinc	1200000	17	ug/100cm2		SW 846 6020 (ICP-MS)

Sample: 050309001-30**Facility ID:****Site:** SLOP**Customer # : 0502779****County:** St. Louis City**Collect Date:** 3/7/2005**Collector:** Hugh Murrell**Affiliation:** ESP**Collect Time:** 3:40 PM**Matrix:** Wipe**Sample Comment:** Firing point, T2

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony	Antimony	45000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Arsenic	Arsenic	2900	17	ug/100cm2		SW 846 6020 (ICP-MS)
Beryllium	Beryllium	48.0	17	ug/100cm2		SW 846 6020 (ICP-MS)
Cadmium	Cadmium	670	17	ug/100cm2		SW 846 6020 (ICP-MS)
Copper	Copper	1200000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Iron	Iron	7000000	17	ug/100cm2		SW 846 6010B (ICP)
Lead	Lead	570000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Mercury	Mercury	140	17	ug/100cm2		SW 846 - 7471A
Nickel	Nickel	4000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Nitroaromatics	1,3,5-Trinitrobenzene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	1,3-Dinitrobenzene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2,4,6-Trinitrotoluene	0.50	ND,04	ug/100cm2		8330



Sample: 050309001-30

Facility ID:

Site:

SLOP

Customer # : 0502779

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 3:40 PM

Matrix: Wipe

Sample Comment: Firing point, T2

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Nitroaromatics	2,4-Dinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2,6-Dinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2-Amino-4,6-dinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2-Nitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	3-Nitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	4-Amino-2,6-dinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	4-Nitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	HMX	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	Nitrobenzene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	RDX	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	Tetryl	0.50	ND,04	ug/100cm2		8330
Selenium	Selenium	280	17	ug/100cm2		SW 846 6020 (ICP-MS)
Thallium	Thallium	18.0	17	ug/100cm2		SW 846 6020 (ICP-MS)
Zinc	Zinc	190000	17	ug/100cm2		SW 846 6020 (ICP-MS)

Sample: 050309001-31

Facility ID:

Site:

SLOP

Customer # : 0502780

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 3:50 PM

Matrix: Wipe

Sample Comment: Firing point, T3

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony	Antimony	100000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Arsenic	Arsenic	2300	17	ug/100cm2		SW 846 6020 (ICP-MS)
Beryllium	Beryllium	< 6	17	ug/100cm2		SW 846 6020 (ICP-MS)
Cadmium	Cadmium	710	17	ug/100cm2		SW 846 6020 (ICP-MS)
Copper	Copper	1100000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Iron	Iron	7000000	17	ug/100cm2		SW 846 6010B (ICP)
Lead	Lead	1500000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Mercury	Mercury	160	17	ug/100cm2		SW 846 - 7471A
Nickel	Nickel	3800	17	ug/100cm2		SW 846 6020 (ICP-MS)
Nitroaromatics	1,3,5-Trinitrobenzene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	1,3-Dinitrobenzene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2,4,6-Trinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2,4-Dinitrotoluene	0.50	ND,04	ug/100cm2		8330



Sample: 050309001-31

Facility ID:

Site:

SLOP

Customer #: 0502780

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 3:50 PM

Matrix: Wipe

Sample Comment: Firing point, T3

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Nitroaromatics	2,6-Dinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2-Amino-4,6-dinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	2-Nitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	3-Nitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	4-Amino-2,6-dinitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	4-Nitrotoluene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	HMX	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	Nitrobenzene	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	RDX	0.50	ND,04	ug/100cm2		8330
Nitroaromatics	Tetryl	0.50	ND,04	ug/100cm2		8330
Selenium	Selenium	90.0	17	ug/100cm2		SW 846 6020 (ICP-MS)
Thallium	Thallium	7.00	17	ug/100cm2		SW 846 6020 (ICP-MS)
Zinc	Zinc	780000	17	ug/100cm2		SW 846 6020 (ICP-MS)

Sample: 050309001-32

Facility ID:

Site:

SLOP

Customer #: 0502781

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 4:00 PM

Matrix: Wipe

Sample Comment: Point of impact; skipped tunnel

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony	Antimony	6000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Arsenic	Arsenic	5000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Beryllium	Beryllium	< 6	17	ug/100cm2		SW 846 6020 (ICP-MS)
Cadmium	Cadmium	470	17	ug/100cm2		SW 846 6020 (ICP-MS)
Copper	Copper	41000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Iron	Iron	210000000	17	ug/100cm2		SW 846 6010B (ICP)
Lead	Lead	110000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Magnesium	Magnesium	210000	17	mg/100 cm2		SW 846 6010B (ICP)
Mercury	Mercury	31.0	17	ug/100cm2		SW 846 - 7471A
Nickel	Nickel	28000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Perchlorate	Perchlorate	<400	04	ug/100cm2		Contract Lab Dependent
Selenium	Selenium	< 40	17	ug/100cm2		SW 846 6020 (ICP-MS)
Thallium	Thallium	< 3	17	ug/100cm2		SW 846 6020 (ICP-MS)
Total Phosphorus	Total Phosphorus	63000	04	ug/100cm2		Contract Lab Dependent



Sample: 050309001-32

Facility ID:

Site:

SLOP

Customer # : 0502781

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation:

ESP

Collect Time: 4:00 PM

Matrix: Wipe

Sample Comment: Point of impact; skipped tunnel

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Zinc	Zinc	210000	17	ug/100cm2		SW 846 6020 (ICP-MS)

Sample: 050309001-33

Facility ID:

Site:

SLOP

Customer # : 0502782

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation:

ESP

Collect Time: 4:10 PM

Matrix: Wipe

Sample Comment: Vent; T2

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony	Antimony	8500	17	ug/100cm2		SW 846 6020 (ICP-MS)
Arsenic	Arsenic	350	17	ug/100cm2		SW 846 6020 (ICP-MS)
Beryllium	Beryllium	< 6	17	ug/100cm2		SW 846 6020 (ICP-MS)
Cadmium	Cadmium	1100	17	ug/100cm2		SW 846 6020 (ICP-MS)
Copper	Copper	15000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Iron	Iron	2500000	17	ug/100cm2		SW 846 6010B (ICP)
Lead	Lead	350000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Magnesium	Magnesium	68000 <i>See Addendum</i>	17	mg/100 cm2		SW 846 6010B (ICP)
Mercury	Mercury	8.70	17	ug/100cm2		SW 846 - 7471A
Nickel	Nickel	950	17	ug/100cm2		SW 846 6020 (ICP-MS)
Perchlorate	Perchlorate	<400	04	ug/100cm2		Contract Lab Dependent
Selenium	Selenium	78.0	17	ug/100cm2		SW 846 6020 (ICP-MS)
Thallium	Thallium	< 3	17	ug/100cm2		SW 846 6020 (ICP-MS)
Total Phosphorus	Total Phosphorus	22000	04	ug/100cm2		Contract Lab Dependent
Zinc	Zinc	9400000	17	ug/100cm2		SW 846 6020 (ICP-MS)

Sample: 050309001-34

Facility ID:

Site:

SLOP

Customer # : 0502783

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation:

ESP

Collect Time: 4:15 PM

Matrix: Wipe

Sample Comment: Point of impact; T1

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony	Antimony	10000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Arsenic	Arsenic	5500	17	ug/100cm2		SW 846 6020 (ICP-MS)
Beryllium	Beryllium	60.0	17	ug/100cm2		SW 846 6020 (ICP-MS)



Sample: 050309001-34

Facility ID:

Site:

SLOP

Customer # : 0502783

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 4:15 PM

Matrix: Wipe

Sample Comment: Point of Impact; T1

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Cadmium	Cadmium	1500	17	ug/100cm2		SW 846 6020 (ICP-MS)
Copper	Copper	38000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Iron	Iron	110000000	17	ug/100cm2		SW 846 6010B (ICP)
Lead	Lead	26000000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Magnesium	Magnesium	1600000	17	mg/100 cm2		SW 846 6010B (ICP)
Mercury	Mercury	120	17	ug/100cm2		SW 846 - 7471A
Nickel	Nickel	18000	17	ug/100cm2		SW 846 6020 (ICP-MS)
PCBs	Aroclor 1016 (PCB-1016)	0.10	ND	ug/100cm2	Q030905-01pcb	8082
PCBs	Aroclor 1221 (PCB-1221)	0.10	ND	ug/100cm2	Q030905-01pcb	8082
PCBs	Aroclor 1232 (PCB-1232)	0.10	ND	ug/100cm2	Q030905-01pcb	8082
PCBs	Aroclor 1242 (PCB-1242)	0.10	ND	ug/100cm2	Q030905-01pcb	8082
PCBs	Aroclor 1248 (PCB-1248)	0.10	ND	ug/100cm2	Q030905-01pcb	8082
PCBs	Aroclor 1254 (PCB-1254)	0.10	ND	ug/100cm2	Q030905-01pcb	8082
PCBs	Aroclor 1260 (PCB-1260)	0.10	ND	ug/100cm2	Q030905-01pcb	8082
Perchlorate	Perchlorate	<400	04	ug/100cm2		Contract Lab Dependent
Selenium	Selenium	160	17	ug/100cm2		SW 846 6020 (ICP-MS)
Thallium	Thallium	56.0	17	ug/100cm2		SW 846 6020 (ICP-MS)
Total Phosphorus	Total Phosphorus	440000	04	ug/100cm2		Contract Lab Dependent
Zinc	Zinc	660000	17	ug/100cm2		SW 846 6020 (ICP-MS)

Sample: 050309001-35

Facility ID:

Site:

SLOP

Customer # : 0502784

County: St. Louis City

Collect Date: 3/7/2005

Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 4:25 PM

Matrix: Wipe

Sample Comment: Short tunnel wipe

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony	Antimony	12000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Arsenic	Arsenic	1100	17	ug/100cm2		SW 846 6020 (ICP-MS)
Beryllium	Beryllium	14.0	17	ug/100cm2		SW 846 6020 (ICP-MS)
Cadmium	Cadmium	1700	17	ug/100cm2		SW 846 6020 (ICP-MS)
Copper	Copper	26000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Iron	Iron	1600000	17	ug/100cm2		SW 846 6010B (ICP)
Lead	Lead	4100000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Magnesium	Magnesium	440000	17	mg/100 cm2		SW 846 6010B (ICP)



Sample: 050309001-35**Facility ID:****Site:**

SLOP

Customer #: 0502784**County:** St. Louis City**Collect Date:** 3/7/2005**Collector:** Hugh Murrell**Affiliation:** ESP**Collect Time:** 4:25 PM**Matrix:** Wipe**Sample Comment:** Short tunnel wipe

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Mercury	Mercury	32.0	17	ug/100cm2		SW 846 - 7471A
Nickel	Nickel	2400	17	ug/100cm2		SW 846 6020 (ICP-MS)
Perchlorate	Perchlorate	<400	04	ug/100cm2		Contract Lab Dependent
Selenium	Selenium	200	17	ug/100cm2		SW 846 6020 (ICP-MS)
Thallium	Thallium	16.0	17	ug/100cm2		SW 846 6020 (ICP-MS)
Total Phosphorus	Total Phosphorus	75000	04	ug/100cm2		Contract Lab Dependent
Zinc	Zinc	2500000	17	ug/100cm2		SW 846 6020 (ICP-MS)

Sample: 050309001-36**Facility ID:****Site:**

SLOP

Customer #: 0502785**County:** St. Louis City**Collect Date:** 3/7/2005**Collector:** Hugh Murrell**Affiliation:** ESP**Collect Time:** 4:35 PM**Matrix:** Wipe**Sample Comment:** Long tunnel wipe

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Antimony	Antimony	9900	17	ug/100cm2		SW 846 6020 (ICP-MS)
Arsenic	Arsenic	530	17	ug/100cm2		SW 846 6020 (ICP-MS)
Beryllium	Beryllium	10.0	17	ug/100cm2		SW 846 6020 (ICP-MS)
Cadmium	Cadmium	460	17	ug/100cm2		SW 846 6020 (ICP-MS)
Copper	Copper	5300	17	ug/100cm2		SW 846 6020 (ICP-MS)
Iron	Iron	1400000	17	ug/100cm2		SW 846 6010B (ICP)
Lead	Lead	12000000	17	ug/100cm2		SW 846 6020 (ICP-MS)
Magnesium	Magnesium	140000 See Addendum	17	mg/100 cm2		SW 846 6010B (ICP)
Mercury	Mercury	240	17	ug/100cm2		SW 846 - 7471A
Nickel	Nickel	1100	17	ug/100cm2		SW 846 6020 (ICP-MS)
Perchlorate	Perchlorate	<400	04	ug/100cm2		Contract Lab Dependent
Selenium	Selenium	240	17	ug/100cm2		SW 846 6020 (ICP-MS)
Thallium	Thallium	4.20	17	ug/100cm2		SW 846 6020 (ICP-MS)
Total Phosphorus	Total Phosphorus	50000	04	ug/100cm2		Contract Lab Dependent
Zinc	Zinc	51000	17	ug/100cm2		SW 846 6020 (ICP-MS)



The analysis of this sample was performed in accordance with procedures approved or recognized by the U.S. Environmental Protection Agency.

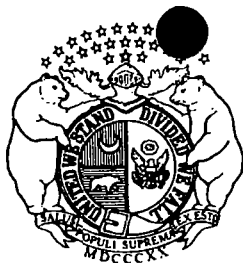
Qualifier Descriptions

- | | |
|---|---|
| 01 Improper collection method | 11 Estimated value, matrix interference |
| 02 Improper preservation | 12 Insufficient quantity |
| 03 Exceeded holding time | 13 Estimated value, true result is > reported value |
| 04 Analyzed by Contract Laboratory | 14 Estimated value, non-homogeneous sample |
| 05 Estimated value, detected below PQL | 15 No Result - Failed Quality Controls Requirements |
| 06 Estimated value, QC data outside limits | 16 Not analyzed - related analyte not detected |
| 07 Estimated value, analyte outside calibration range | 17 Results in dry weight |
| 08 Analyte present in blank at > 1/2 reported value | 18 Sample pH is outside the acceptable range |
| 09 Sample was diluted during analysis | ND Not detected at reported value |
| 10 Laboratory error | |

Earl Babst

Earl Babst, Program Director
Environmental Services Program
Air and Land Protection Division



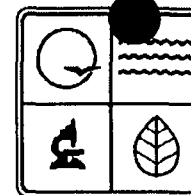


Addendum Report

Please Attach to Original Order Report

RECEIVED

JUN 09 2005

Hazardous Waste Program
MO Dept. of Natural Resources

Order ID: 050309001

Program, Contact: HWP, Christine O'Keefe

Date Amended: 6/7/2005

LDPR: QEBWN/NJ01SLOP

Order Comment:



Reason for Addendum: Magnesium Results corrected.

Sample: 050309001-32

Facility ID:

Site:

SLOP

Customer #: 0502781

County: St. Louis City

Sample Reference ID:

Collect Date: 3/7/2005



Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 4:00 PM

Matrix: Wipe

Sample Comment: Point of impact; skipped tunnel

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Magnesium	Magnesium	210	17	mg/100 cm2		SW 846 6010B (ICP)

Sample: 050309001-33

Facility ID:

Site:

SLOP

Customer #: 0502782

County: St. Louis City

Sample Reference ID:

Collect Date: 3/7/2005



Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 4:10 PM

Matrix: Wipe

Sample Comment: Vent; T2

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Magnesium	Magnesium	68.0	17	mg/100 cm2		SW 846 6010B (ICP)

Sample: 050309001-34

Facility ID:

Site:

SLOP

Customer #: 0502783

County: St. Louis City

Sample Reference ID:

Collect Date: 3/7/2005



Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 4:15 PM

Matrix: Wipe

Sample Comment: Point of impact; T1

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Magnesium	Magnesium	1600	17	mg/100 cm2		SW 846 6010B (ICP)

Sample: 050309001-35

Facility ID:

Site:

SLOP

Customer # : 0502784

County: St. Louis City

Sample Reference ID:

Collect Date: 3/7/2005



Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 4:25 PM

Matrix: Wipe

Sample Comment: Short tunnel wipe

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Magnesium	Magnesium	440	17	mg/100 cm2		SW 846 6010B (ICP)

Sample: 050309001-36

Facility ID:

Site:

SLOP

Customer # : 0502785

County: St. Louis City

Sample Reference ID:

Collect Date: 3/7/2005



Collector: Hugh Murrell

Affiliation: ESP

Collect Time: 4:35 PM

Matrix: Wipe

Sample Comment: Long tunnel wipe

Test	Parameter	Result	Qualifier	Units	QC BatchID	Method
Magnesium	Magnesium	140	17	mg/100 cm2		SW 846 6010B (ICP)

The analysis of this sample was performed in accordance with procedures approved or recognized by the U.S. Environmental Protection Agency.

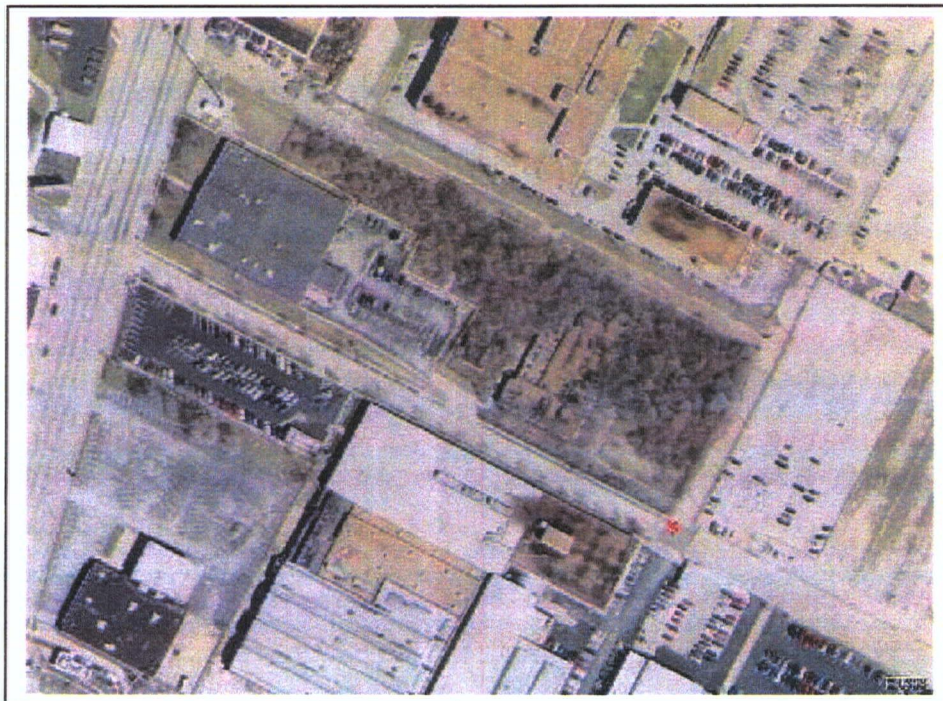
Qualifier Descriptions

- | | |
|---|---|
| 01 Improper collection method | 11 Estimated value, matrix interference |
| 02 Improper preservation | 12 Insufficient quantity |
| 03 Exceeded holding time | 13 Estimated value, true result is > reported value |
| 04 Analyzed by Contract Laboratory | 14 Estimated value, non-homogeneous sample |
| 05 Estimated value, detected below PQL | 15 No Result - Failed Quality Controls Requirements |
| 06 Estimated value, QC data outside limits | 16 Not analyzed - related analyte not detected |
| 07 Estimated value, analyte outside calibration range | 17 Results in dry weight |
| 08 Analyte present in blank at > 1/2 reported value | 18 Sample pH is outside the acceptable range |
| 09 Sample was diluted during analysis | ND Not detected at reported value |
| 10 Laboratory error | |

Earl Pabst, Program Director
Environmental Services Program
Air and Land Protection Division

APPENDIX G
PHOTOGRAPHS

SLOP Ex-Army Underground Firing Range
St. Louis, Missouri



1. Aerial photograph of site taken March 22, 2002. (North ↑)
Obtained from USGS TerraServer website.



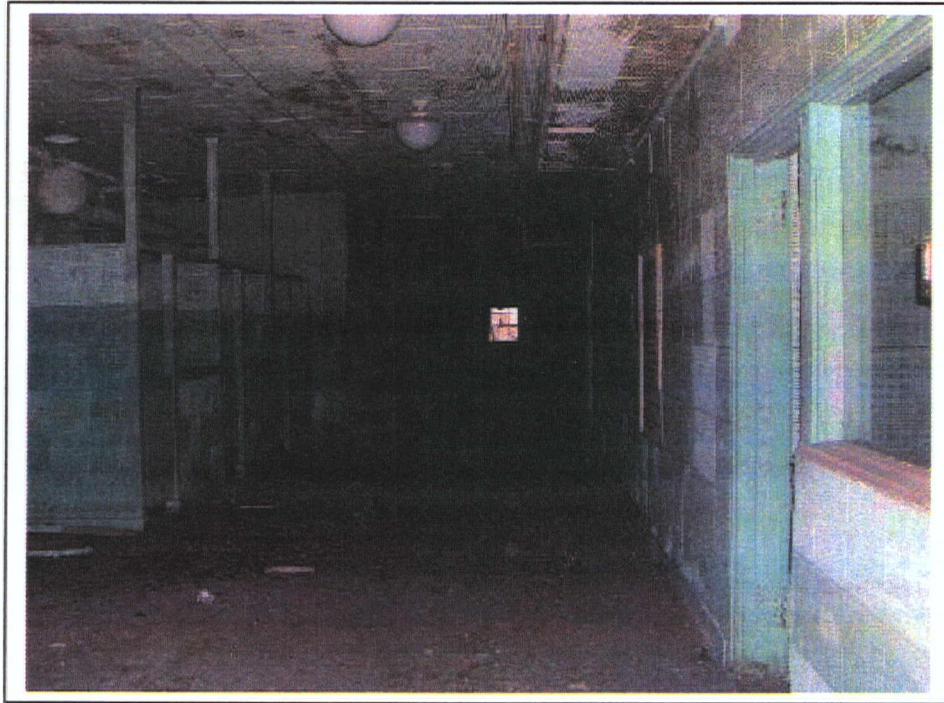
2. View of Southwest corner of main building showing one-story design and
overgrowth of vegetation. Photo taken by S. Muenks on December 16, 2004.



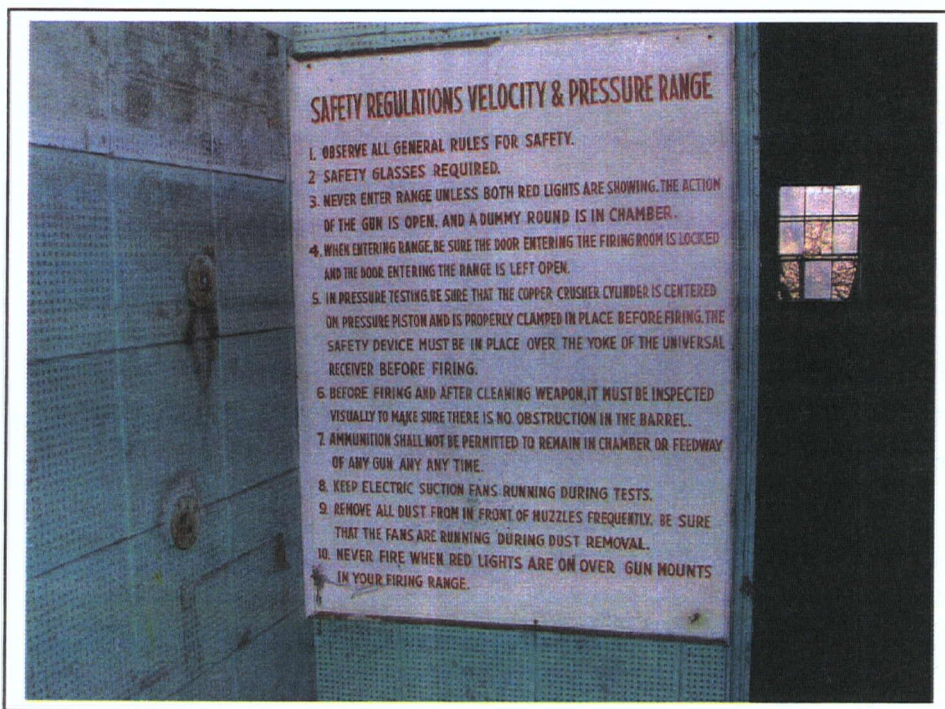
3. View of main hallway looking west showing collapsed roof, paint peeling off walls and general disrepair. Photo taken by S. Muenks on January 26, 2005.



4. View of office area looking east showing remaining boxes of empty spools and debris scattered on the floor. Photo taken by S. Muenks on January 26, 2005.



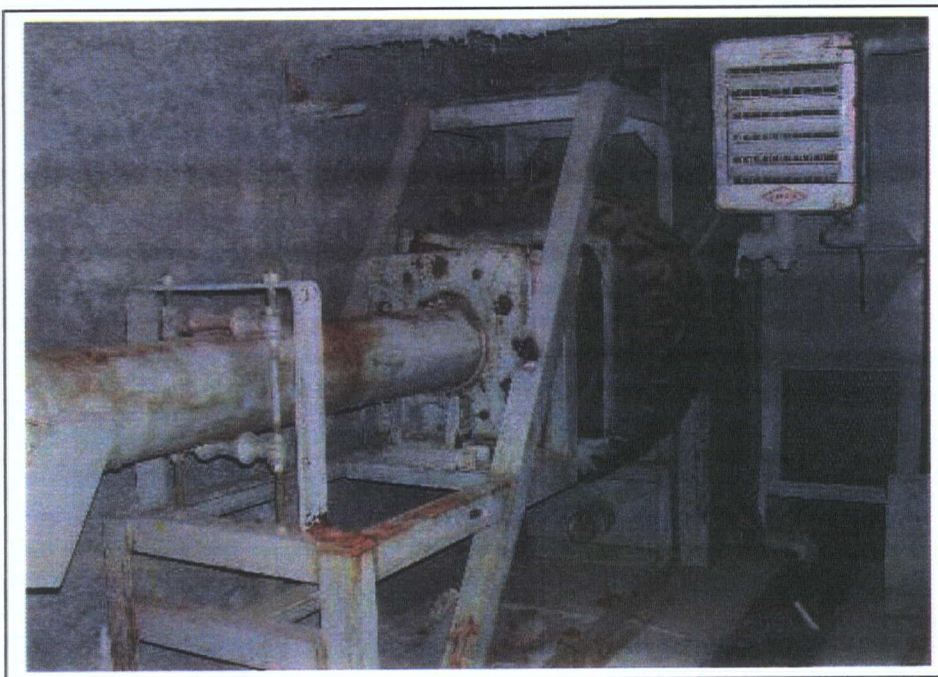
5. View looking north down firing station corridor. Firing stations are on the left.
Photo taken by S. Muenks on January 26, 2005.



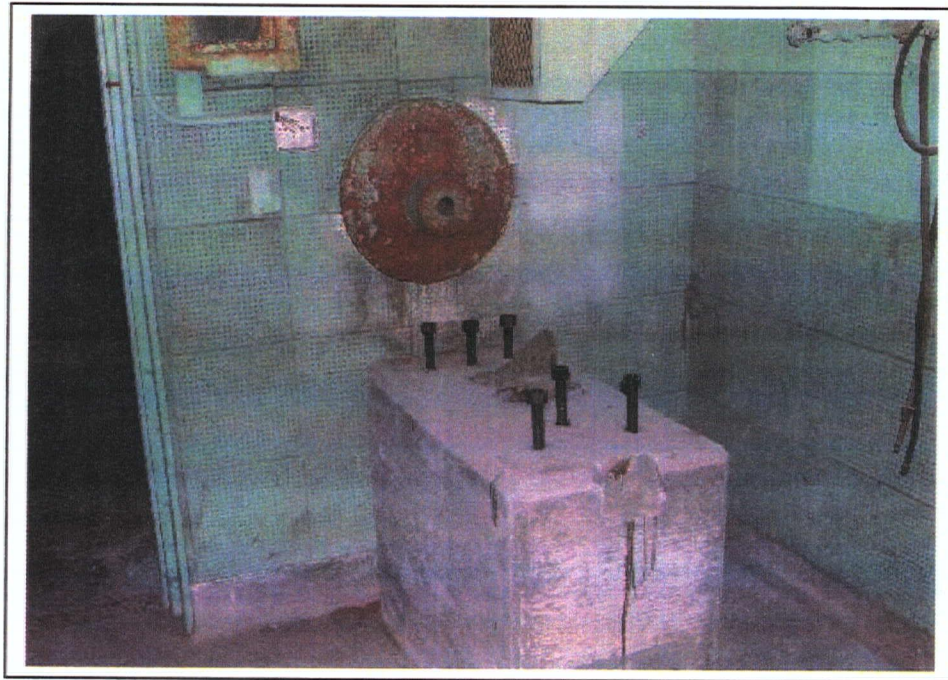
6. Sign near firing stations listing safety regulations for the Velocity and Pressure Range.
Photo taken by S. Muenks on March 7, 2005.



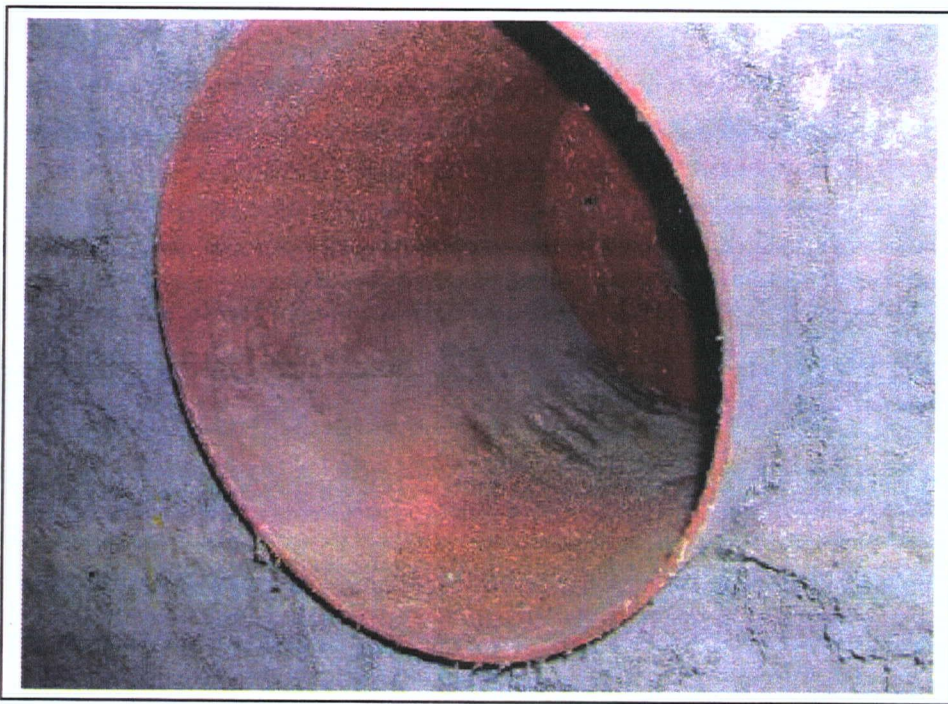
7. View of firing station No. 16 showing concrete gun mount and metal plate in wall with opening into metal tube in vault on opposite side. Note chute for spent casings and ventilation shaft above. Photo taken by S. Muenks on January 26, 2005.



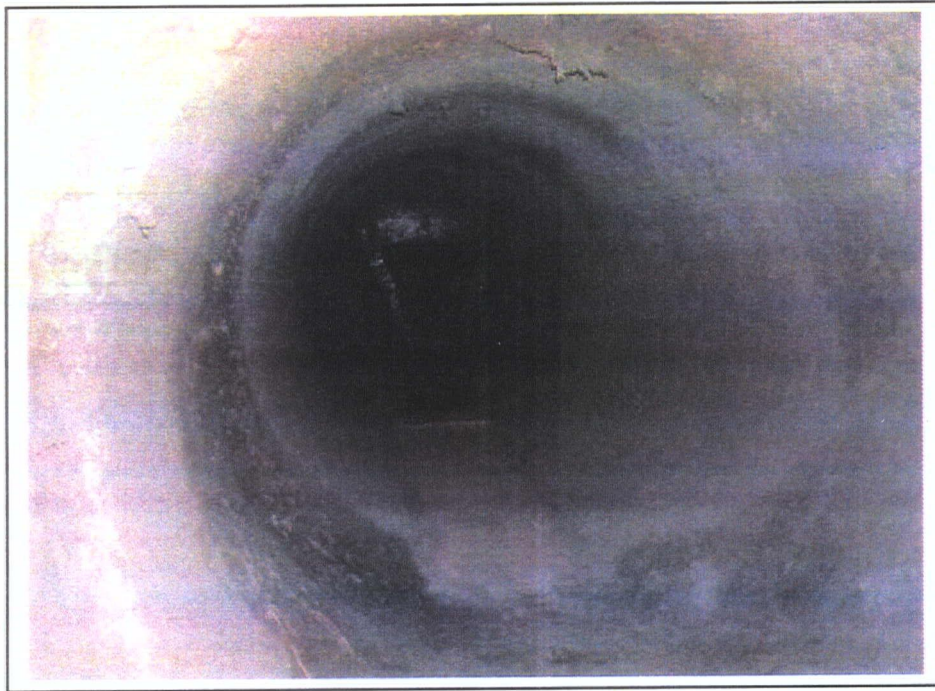
8. Opposite end of firing station No. 16 showing metal tube into which bullets were fired. Note chute at left end of tube for spent rounds to fall out into a hopper. Photo taken by S. Muenks on January 26, 2005.



9. View of firing station No. 4 showing gun mount and opening in wall for bullet trajectory into a tunnel. Note doorway on the left allowing access into the tunnel on the opposite side. Photo taken by S. Muenks on March 7, 2005.



10. View of opposite end of wall of firing station No. 4. This was the location for wipe samples collected at the firing points. Photo taken by S. Muenks on March 7, 2005.



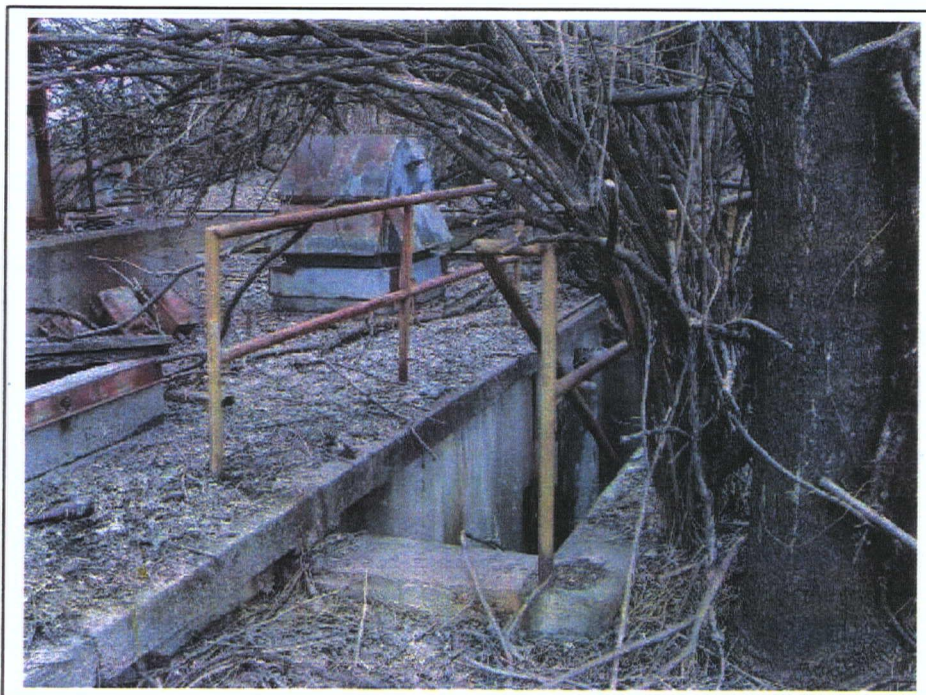
11. View from firing point looking down a tunnel. Note sprayed on material that is falling from the walls and metal triangular frame standing in the center of the tunnel.
Photo taken by S. Muenks on January 26, 2005.



12. View looking into bullet trap at end on tunnel. Note the floor slopes forward and to the left, leading to an opening at the lower left hand corner.
Photo taken by S. Muenks on March 7, 2005.



13. View of an elevator tower at the end of the tunnels looking north. Note the chute coming off the left of the tower and guardrails at the base surrounding stairs leading down to the tunnels. Photo taken by S. Muenks on March 7, 2005.



14. View of stairway leading down into tunnels from base of elevator tower looking northeast. Note the ventilation hood in the background. Photo taken by S. Muenks on March 7, 2005.



15. Collapsed tower showing scoops on chain used to extract sand and bullets from traps.
Photo taken by S. Muenks on March 7, 2005.



16. View of boring B1 located at the southwest corner of one of the shorter tunnels
looking north. Note the elevator tower in the background.
Photo taken by S. Muenks on March 7, 2005.



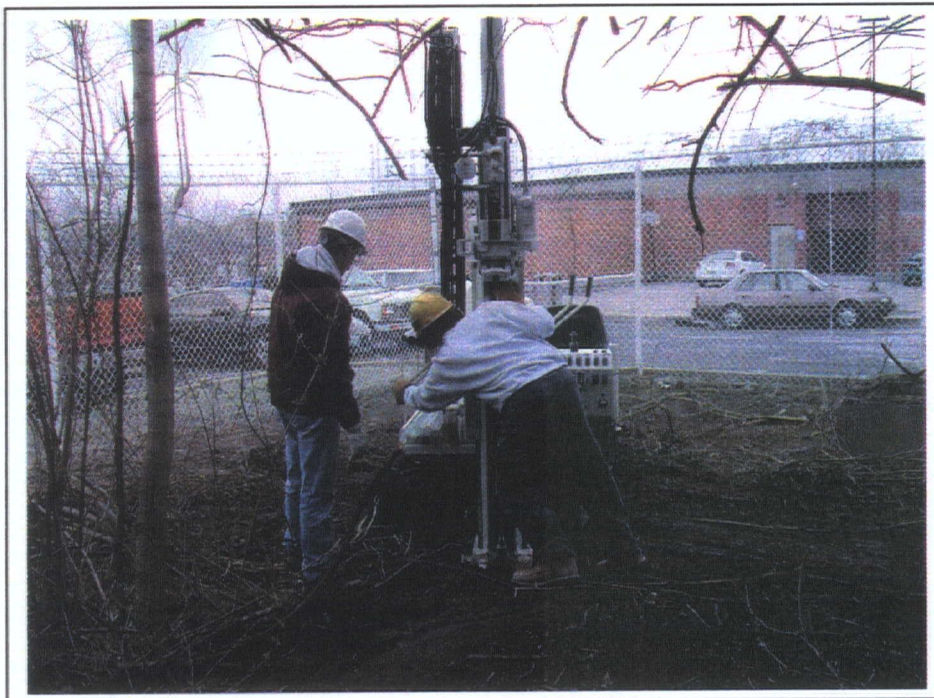
17. View of boring B2 located on the east side of concrete bunker looking west.
Photo taken by S. Muenks on March 7, 2005.



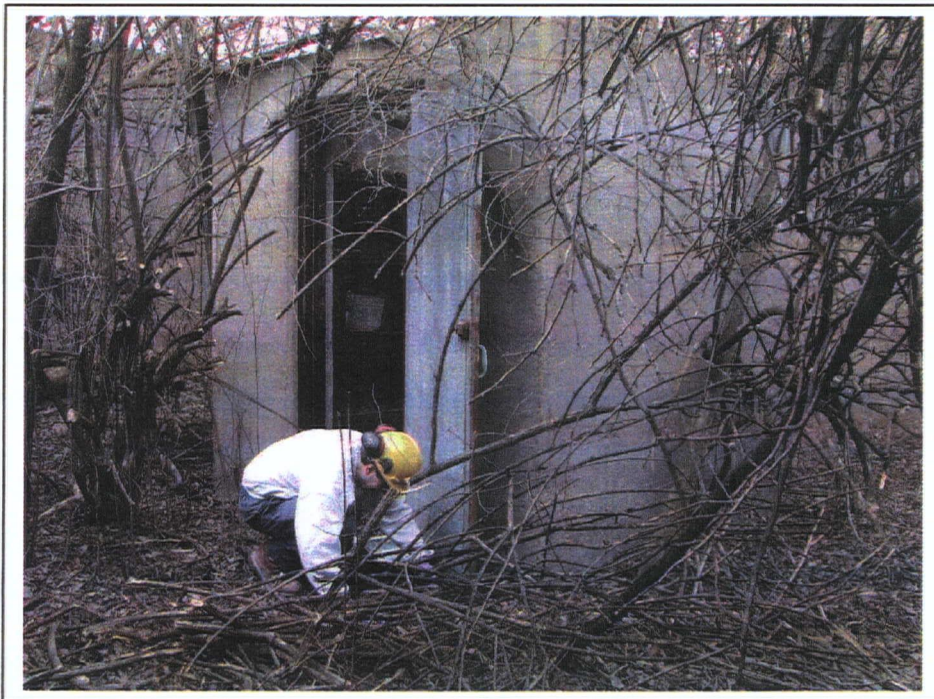
18. View of boring B3 located near the loading dock on the east side of the main building looking west. Photo taken by S. Muenks on March 7, 2005.



19. View of boring B4 located east of the main building at the southeast corner of the property looking west. Photo taken by S. Muenks on March 7, 2005.



20. View of boring B5 located at the southwest corner of the property at the end of a tunnel looking southwest. Note Army Reserve Center in background. Photo taken by S. Muenks on March 7, 2005.



21. View of surface soil sample being collected within concrete bunker. Picture taken from entrance of bunker looking northwest. Note the small concrete vault within the bunker in the background. Photo taken by S. Muenks on March 7, 2005.



22. View of surface soil sample being collected near the building foundation south of the loading dock looking west. Photo taken by S. Muenks on March 7, 2005.

APPENDIX H
ABATEMENT REQUIREMENTS

SLOP Ex-Army Underground Firing Range
St. Louis, Missouri



Requirements for Asbestos and Lead Paint Abatement

Hazardous Waste Program technical bulletin

9/2004

Abatement of asbestos-containing material (ACM) and lead-based paint (LBP) are regulated by various federal, state and local laws and regulations. This combined with the large volume of routine work performed across the nation has resulted in standard industry practices. Projects performed under the department's Brownfields/Voluntary Cleanup Program (B/VCP) involving ACM and LBP abatement must comply with these and other local, state and federal rules and regulations.

Because asbestos and LBP abatement projects tend to follow a standard "cookbook" approach and fall under the jurisdiction of existing inspection and enforcement programs, the department has sought to minimize additional paperwork required to perform these projects under the B/VCP. Department approval of a Remedial Action Plan (RAP) is required by the B/VCP prior to hazardous substance cleanups pursuant to 10 CSR 25.010(5). For ACM and LBP abatement, certain basic items should be included in the RAP, as described in the following sections. Not all projects may require every item. Likewise, there may be special circumstances for a given project that require responses not listed here. Those will be determined on a case-by-case basis by the B/VCP's project manager for the site.

Asbestos

In most of Missouri, ACM is regulated by the department's Air Pollution Control Program (APCP) pursuant to 40 CFR Part 61, Subpart M, *"The National Emission Standard for Asbestos,"* (NESHAP). However, there are four key areas of the state where the department has delegated asbestos-related activities to local authorities: Kansas City, St. Louis, St. Louis County and Springfield. It is very important when performing an asbestos-related project in one of these areas that you contact the appropriate agency with jurisdiction in that area to determine all applicable requirements. These local agencies enforce their own rules, which may be more stringent than state regulations. The local agencies are listed below with contact phone numbers.

Jurisdiction	Agency	Phone
St. Louis (City)	St. Louis Division of Air Pollution Control	(314) 613-7300
St. Louis (County)	St. Louis County Health Department	(314) 615-8923
Kansas City	Kansas City Health Dept., Air Quality Section	(816) 513-6314
Springfield	Springfield-Greene County Health Dept.	(417) 864-1662



B/VCP Remedial Action Plan (RAP) for Asbestos Abatement

If a Certification of Completion for a site is desired from the department under the B/VCP, the site must be enrolled in the B/VCP with a signed letter of agreement prior to remediation of any hazardous substances on the site. The B/VCP must review and approve all RAPs prior to implementation.

Asbestos abatement plans may be included as part of a general RAP for a B/VCP site in the event that other remediation is required. Asbestos abatement may also be done under a separate RAP.

The RAP should include, but not be limited to, the following information:

1. Copies of any asbestos inspection or survey reports, to include
 - Tables showing all suspect ACM tested, results including percent asbestos, type of asbestos and quantity of material (sq. ft. or linear feet),
 - Lab raw data reports
 - Maps, drawings or photos (photos should be submitted as color photocopies or original prints - no black and white photocopies please)
2. Copies of all abatement notification forms sent to the local government or the department. Kansas City, St. Louis and Springfield and St. Louis County have local air pollution control divisions to which these forms are submitted; for other areas of the state, notifications are sent to the department.
3. General description of abatement techniques to be used in each area of the building and on each different material (for example, whether the work will be done in a sealed area, using glove bags, etc.)
4. Who will perform work and a statement that contractor is a Missouri licensed asbestos abatement contractor
5. Who will perform air monitoring and clearance sampling
6. Final property use goal (i.e. residential, commercial, industrial as defined in *Cleanup Levels for Missouri* (CALM) as scenario A, B or C respectively)

Asbestos Abatement Final Report

When the asbestos abatement work is complete, submit a final report to the B/VCP, to include at a minimum

1. All air monitoring results, including final clearance testing
2. Waste disposal documentation (such as landfill tickets)
3. Description of any ACM to remain in place, along with drawings or maps of location(s)
4. Operation and Maintenance (O&M) plan for any ACM remaining
5. Document any significant deviations from the RAP

A sample O&M Plan for ACM is attached and should be used as a guide only. For B/VCP sites, the department requires that the plan be filed in the property chain of title as an institutional control to ensure that future occupants, maintenance personnel, contractors, owners and prospective buyers are aware of the presence of ACM and of the O&M requirements necessary to maintain safe conditions.

Leaving ACM In Place at B/VCP Sites

Three situations, which have all been encountered at B/VCP sites, are addressed in this section:

1. ACM inside buildings undergoing renovation
2. Random ACM contained in historically buried construction and demolition (C&D) debris onsite
3. Intentional ACM landfills

Leaving ACM In Place in Renovated Structures

While state and federal laws and regulations require proper handling and disposal by qualified personnel if asbestos is removed, there is no requirement that it be removed from a building at any given time unless a building is to be demolished or renovated in such a way that a NESHAP minimum quantity of friable asbestos is disturbed, thus requiring its removal. Other than these situations, the department does not necessarily require removal of all ACM from structures at B/VCP sites as a condition for obtaining a Certification of Completion through the B/VCP.

It may be necessary or desirable to remove some ACM and leave other material in place in a building. Some examples are asbestos floor tile, asbestos pipe insulation in areas that are inaccessible or will not be modified, and transite materials on building exteriors.

Potentially friable asbestos materials to be left in place must be "encapsulated" (coated, fully enclosed, etc.) using standard industry practices. As required by regulations, clearance sampling must be conducted following the removal and encapsulation work.

The owner must develop an Operation and Maintenance Plan (details below) for material left in place. If a Restrictive Covenant is to be executed for the site related to other aspects of a cleanup (for example, restricted use soil cleanup standards were used, or soil contamination is left on-site under a cap), the O&M plan can be included as an attachment to the covenant. If no Covenant is to be executed, the O&M plan should be a stand-alone document.

Operation and Maintenance Plan for ACM In Structures

An Operation and Maintenance Plan for ACM should include the following:

- Location of the ACM within the building(s) including maps and drawings as appropriate
- Description of material including type and quantity
- Description of accessibility (i.e. in restricted access area or not)
- Protocol and schedule for regular inspections
- Contingency plans to be implemented in the event the ACM is damaged or the material must be disturbed, for example during maintenance of insulated equipment or nearby equipment or structures.

The O & M Plan must be reviewed and approved by B/VCP. The presence of ACM and the existence of an O&M Plan will be referred to in the B/VCP Certification of Completion for the site. The Certification will be contingent upon the O&M plan being followed. Both documents must be filed in the property chain of title.

Buried Asbestos-Containing Building Debris

This section applies to ACM as a constituent of historical fill material such as from demolition of former buildings and burial of the debris in the building's basement, a situation commonly encountered at urban redevelopment sites. This on-site disposal of C&D debris, whether it contains ACM or not, is not allowed under current solid waste regulations, but was common practice

in the past. Old building debris may have poor geotechnical characteristics and sometimes must be removed to provide a suitable building pad or to install foundation footers. This may result in the excavation of ACM or ACM-contaminated debris.

In most cases, the department does not consider it necessary to excavate large volumes of buried demolition debris for the sole purpose of recovering a relatively small amount of ACM. However, any material dug up that is suspected ACM (for example, pipe insulation) should be segregated and either tested, or assumed to be ACM, and disposed of appropriately. The excavation should be overseen by, and any ACM handled by, trained asbestos abatement personnel, in accordance with current asbestos regulations. If there is no reason to suspect that large quantities of ACM were landfilled at the site and such materials are not encountered during excavation (i.e., no ACM left on-site beyond de minimus quantities in buried demolition debris), no institutional controls are necessary upon closure of the B/VCP site.

Historical Asbestos Disposal Sites

Large quantities of ACM were buried prior to the advent of landfill permitting requirements. These materials may include, but are not limited to, scrap from the production of transite building products, brake pad or drum production or refurbishing wastes, or refractory materials. These wastes were sometimes deposited near the production facility. Under the B/VCP, remedial action alternatives have included both removal and encapsulation in place. Removal must be followed by disposal in a permitted landfill in accordance with asbestos and solid waste regulations. For B/VCP sites, the installation of an engineered cap always requires placement of a restrictive covenant in the property chain of title to provide for maintenance and to prevent disturbance of the landfill, as outlined in the CALM guidance. As with all remedial actions overseen by the B/VCP, a RAP must be reviewed and approved by the department prior to implementation.

For More Information

For more information on asbestos, see:

- Asbestos Fact Sheet, Missouri Department of Natural Resources (pub 2077) www.dnr.mo.gov/oac/pub2077.pdf
- U.S. Environmental Protection Agency Asbestos Home Page: www.epa.gov/asbestos/Index.htm
- Contact the Air Pollution Control Program at 1-800-361-4827 or (573) 751-4817 or local authorities listed on Page 1.

Lead-Based Paint

Removal of LBP and LBP dust that may be a hazard to human health or the environment (i.e. flaking and peeling paint) is required for renovation projects overseen by the B/VCP. Paint in good condition may be left in place provided that exposures are minimized and appropriate institutional controls are put in place.

Abatement projects must follow all state and federal regulations including clearance sampling to satisfy B/VCP standards pertaining to lead based paint (CALM Appendix A).

Encapsulation usually involves recoating lead painted surfaces with suitable sealants such as epoxy paint, concrete, drywall, etc. If LBP is to be left in the building, an Operation and Maintenance (O&M) Plan must be prepared. For B/VCP sites, the department requires that the O&M

plan be filed in the property chain of title as an institutional control to ensure that future occupants, maintenance personnel, contractors, owners, and prospective buyers are aware of the presence of LBP and of the O&M requirements necessary to maintain safe conditions.

B/VCP Remedial Action Plan for Lead Paint Abatement

If a Certification of Completion is to be obtained from the department under the B/VCP, the site must be enrolled in the B/VCP with a signed letter of agreement. The B/VCP must review and approve all RAPs prior to implementation.

Lead paint abatement plans may be included as part of a general Remedial Action Plan for a B/VCP site in the event that other remediation is required. Lead paint abatement may also be done under a separate RAP.

Lead paint abatement standards for final clearance (CALM 2001) are shown in the table below (also refer to CALM Appendix B).

Table 1: Lead Paint Clearance Criteria

Sample Location	Scenario A Unrestricted Use ¹ Micrograms per sq. ft.	Scenario B and C Commercial and Industrial ² Micrograms per sq. ft.
Floors	40	200
Window Sills (interior)	250	500
Window Wells (interior)	800	800

1 EPA

2 Missouri Office of Administration

The RAP should include, but not be limited to, the following information:

1. Copies of any LBP inspection or survey reports, to include:
 - Tables showing all suspect paint tested and test results including percent lead, paint color and square footage
 - Laboratory raw data reports
 - Maps, drawings or photos (photos should be submitted as color photocopies or original prints - no black and white photocopies please)
2. General description of abatement techniques to be used in each area of the building including workspace isolation, paint removal, dust suppression and final cleaning
3. Clearance sampling protocols including approximate sample locations, approximate number of samples, sample type (wall, floor, window sill, window well)
4. Clearance sampling goals
5. Who will perform abatement work, air monitoring and clearance sampling; documentation of credentials and certifications
6. Final property use goal (i.e. residential, commercial, industrial as defined in CALM as scenario A, B or C respectively)

Final Report

When the LBP abatement work is complete, submit a final report to the B/VCP, to include

1. Final clearance wipe sampling results
2. Waste disposal documentation (such as landfill tickets)
3. Whether any lead painted surfaces remain along with drawings or maps of location(s)
4. O&M plan if any LBP remains
5. Document any significant deviations from the RAP

A sample O&M Plan for LBP is attached. For B/VCP sites, the department requires that the O&M plan be filed in the property chain of title as an institutional control to ensure that future occupants, maintenance personnel, contractors, owners, and prospective buyers are aware of the presence of LBP and of the O&M requirements to maintain safe conditions.

Operation and Maintenance Plan for Lead Paint in Structures

An Operation and Maintenance (O&M) Plan for LBP should include the following:

1. Location of the LBP within the building(s) including maps and drawings showing the location of LBP
2. Description of accessibility (i.e. in restricted access area or not)
3. Protocol and schedules for regular inspections
4. Contingency plans to be referred to in the event that the LBP, or its encapsulating material, is damaged or must be disturbed during maintenance or renovation

The O&M Plan must be reviewed and approved by the B/VCP. The presence of the LBP and the existence of the O&M Plan will be referred to in the B/VCP Certification of Completion for the site. The Certification will be contingent upon the O&M plan being followed. Both documents should be filed in the property chain of title upon completion of the project.

More Information

For more information on LBP abatement, see

- *Disposal of Demolition Wastes Contaminated with Lead and/or Other Heavy Metals*, Fact Sheet, 8/2004, Missouri Department of Natural Resources (PUB2002).
- U.S. Environmental Protection Agency Office of Lead Programs, www.epa.gov/lead/
- HUD Office of Healthy Homes and Lead Hazard Control: www.hud.gov/lea/leahome.html

For further information call or write
Missouri Department of Natural Resources
Hazardous Waste Program
P.O. Box 176
Jefferson MO 65102-0176
1-800-361-4827 or (573) 751-3176
(573) 751-7869 fax
www.dnr.mo.gov/alpd/hwp

APPENDIX I
BACKGROUND LEVELS

SLOP Ex-Army Underground Firing Range
St. Louis, Missouri

2.15 REGIONAL BACKGROUND**2.15.1 Soils**

Ten surface soil samples were collected from local municipal parks. The sample results were used to calculate regional background levels of metals and PAHs. Five of these samples were collected from Penrose Park, located just south of I-70 on both sides of North Kingshighway Boulevard, approximately 1.3 miles southeast of SLAAP. According to St. Louis City Parks Commissioner, Mr. Dan Skillman, Penrose Park has been owned and operated as a park by the City since 1910. He did not know of any previous industrial activity at this location. He did mention that an underground diesel fuel storage tank had been located near a maintenance shed in the park, however none of the five samples were located near the maintenance shed.

The other five samples were collected from Dwight Davis Park, located north of I-70 and east of Riverview Boulevard between Lillian and Theodore Avenues, approximately 0.4 miles east-northeast of SLAAP. According to Mr. Skillman, this park has been owned and operated by the City since 1951. Since it was possible that industrial facilities could have been present on this property prior to 1951, a 1931 Sanborn map of the park area was reviewed. The entire area of the park was either residences or open lots in 1931. A gas station with three aboveground storage tanks was indicated on the Sanborn map just north of the park, at the southeast corner of Riverview Boulevard and Theodore Avenue. This gas station was not within the park boundaries and no samples were collected from this area.

The locations of these parks in relation to the Site are shown in Figure 2-15.

Table 4-1
Background Data for Metals and PAHs
St. Louis Army Ammunition Plant, St. Louis, Missouri

	BKSB-01(0-0.5)-0902			BKSB-02(0-0.5)-0902			BKSB-03(0-0.5)-0902			BKSB-04(0-0.5)-0902			BKSB-05(0-0.5)-0902		
	Result	Q	QL	Result	Q	QL	Result	Q	QL	Result	Q	QL	Result	Q	QL
SEMIVOLATILES (MG/KG)															
Acenaphthene	0.001	J		0.001	J		0.001	J		U	(0.33)		0.008	J	
Acenaphthylene	0.001	J			U	(0.33)		U	(0.33)	U	(0.33)		0.004	J	
Anthracene	0.004	J		0.005	J		0.004	J		U	(0.33)		0.027	J	
Benzo(a)anthracene	0.046	J		0.043	J		0.033	J		0.003	J		0.15	J	
Benzo(a)pyrene	0.038	J		0.033	J		0.031	J		0.003	J		0.12	J	
Benzo(b)fluoranthene	0.063	J		0.056	J		0.05	J		0.006	J		0.14	J	
Benzo(g,h,i)perylene	0.031	J		0.028	J		0.023	J		U	(0.062)		0.086	J	
Benzo(k)fluoranthene	0.019	J		0.023	J		0.013	J		0.002	J		0.082	J	
Chrysene	0.042	J		0.045	J		0.036	J		0.005	J		0.14	J	
Dibenz(a,h)anthracene	0.015	J		0.013	J		0.014	J		U	(0.062)		0.058	J	
Fluoranthene	0.08	J		0.073	J		0.063	J		0.008	J		0.27	J	
Fluorene	0.001	J		0.001	J		0.001	J		U	(0.33)		0.009	J	
Indeno(1,2,3-cd)pyrene	0.024	J		0.023	J		0.022	J		U	(0.33)		0.072	J	
Naphthalene		U	(0.33)		U	(0.33)		U	(0.33)	U	(0.33)		0.003	J	
Phenanthrene	0.031	J		0.031	J		0.025	J		0.003	J		0.15	J	
Pyrene	0.069	J		0.068	J		0.055	J		0.008	J		0.24	J	
TOTAL METALS (MG/KG)															
Antimony		U	(20)		U	(20)		U	(20)		U	(20)		U	(20)
Arsenic	7.4			6.3			5.3			3.4			6.8		
Barium		R			R			R			R			R	
Beryllium	0.75			0.66			0.65			0.77			0.71		
Cadmium	2.4			2.4			2.3			2.4			2.7		
Chromium	16			17			19			20			17		
Copper	21			20			17			21			31		
Lead	60			46			34			52			97		
Mercury	0.039	J		0.037	J		0.03	J		0.025	J		0.084	J	
Nickel	17			19			15			13			19		
Selenium		U	(20)		U	(20)		U	(20)		U	(20)	3.3	J	
Silver		U	(5)		U	(5)		U	(5)		U	(5)		U	(5)
Thallium	0.3	J		0.26	J		0.17	J		0.19	J		0.28	J	
Zinc	94			86			60			72			136		

Notes:

Italics = Data point excluded from 95% UTL calculation

NC = Not calculated due to an insufficient number of normally distributed data points

Q = Qualifier

QL = Quantitation Limit

Qualifier Notes:

NA = Not analyzed

U = Not detected at the given quantitation limit

J = Concentration is estimated

UJ = Not detected, quantitation limit is an estimate

R = Rejected

**Background Data for Metals and PAHs
St. Louis Army Ammunition Plant, St. Louis, Missouri**

	BKSB-66(0-0.5)-0902			BKSB-67(0-0.5)-0902			BKSB-68(0-0.5)-0902			BKSB-68(0-0.5)-0902-DIL			BKSB-69(0-0.5)-0902		
	Result	Q	QL	Result	Q	QL	Result	Q	QL	Result	Q	QL	Result	Q	QL
SEMIVOLATILES (MG/KG)															
Acenaphthene	0.009	J		0.027	J		0.94				R		0.038	J	
Acenaphthylene	0.006	J		0.012	J		0.016	J			R		0.013	J	
Anthracene	0.045	J		0.076	J			R		2.4			0.14	J	
Benzo(a)anthracene	0.23	J		0.43				R		6.2			0.56		
Benzo(a)pyrene	0.16			0.31				R		3.5			0.51		
Benzo(b)fluoranthene	0.18	J		0.24	J			R		4.2			0.41		
Benzo(g,h,i)perylene	0.18			0.2				R		2.1			0.32		
Benzo(k)fluoranthene	0.053	J		0.25	J			R		2.1			0.28	J	
Chrysene	0.22	J		0.39				R		6			0.47		
Dibenz(a,h)anthracene	0.086			0.13				R		1.3			0.21		
Fluoranthene	0.37	J		0.88				R		13				R	
Fluorene	0.013	J		0.029	J		1				R		0.049	J	
Indeno(1,2,3-cd)pyrene	0.1	J		0.16	J			R		1.7			0.27	J	
Naphthalene	0.002	J			U	(0.33)	0.13	J			R		0.018	J	
Phenanthrene	0.2	J		0.46				R		13			0.7		
Pyrene	0.33			0.66				R		11			0.86		
TOTAL METALS (MG/KG)															
Antimony		U	(20)		U	(20)		U	(20)		NA			U	(20)
Arsenic	5.7			10			18				NA		8.1		
Barium		R			R			R			NA			R	
Beryllium	0.65			0.87			1.4				NA		0.64		
Cadmium	2.4			3.2			6.3				NA		2.9		
Chromium	15			21			43				NA		16		
Copper	25			44			348				NA		37		
Lead	139			183			876				NA		252		
Mercury	0.065	J		0.097	J		0.35				NA		0.18		
Nickel	19			22			40				NA		18		
Selenium		U	(20)		U	(20)		U	(20)		NA			U	(20)
Silver		U	(5)		U	(5)		U	(5)		NA			U	(5)
Thallium	0.28	J		0.33	J		0.44	J			NA		0.26	J	
Zinc	176			266			902				NA		258		

Notes:
 Italics = Data point excluded from 95% UTL calculation
 NC = Not calculated due to an insufficient number of normally distributed data points
 Q = Qualifier
 QL = Quantitation Limit

Qualifier Notes:
 NA = Not analyzed
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 J = Concentration is estimated
 UJ = Not detected, quantitation limit is an estimate
 R = Rejected

Table 4-1
Background Data for Metals and PAHs
St. Louis Army Ammunition Plant, St. Louis, Missouri

	BKSB-09(0-0.5)-0902-DIL			BKSB-10(0-0.5)-0902			95% UTL
	Result	Q	QL	Result	Q	QL	
SEMI-VOLATILES (MG/KG)							
Acenaphthene		R		0.01	J		0.0626
Acenaphthylene		R		0.004	J		0.0305
Anthracene		R		0.034	J		0.216
Benzo(a)anthracene		R		0.27	J		0.887
Benzo(a)pyrene		R		0.16			0.735
Benzo(b)fluoranthene		R		0.28	J		0.626
Benzo(g,h,i)perylene		R		0.13			0.478
Benzo(k)fluoranthene		R		0.037	J		0.457
Chrysene		R		0.2	J		0.758
Dibenz(a,h)anthracene		R		0.08			0.303
Fluoranthene	1.1			0.46			1.74
Fluorene		R		0.014	J		0.0774
Indeno(1,2,3-cd)pyrene		R		0.1	J		0.415
Naphthalene		R		0.002	J		NC
Phenanthrene		R		0.24	J		1.04
Pyrene		R		0.39			1.35
TOTAL METALS (MG/KG)							
Antimony		NA			U	(20)	NC
Arsenic		NA		5.1			13.2
Barium		NA			R		NC
Beryllium		NA		0.57			1.01
Cadmium		NA		1.9			3.84
Chromium		NA		14			25.5
Copper		NA		18			59.1
Lead		NA		78			363
Mercury		NA		0.03	J		0.154
Nickel		NA		13			27.9
Selenium		NA			U	(20)	NC
Silver		NA			U	(5)	NC
Thallium		NA		0.23	J		0.53
Zinc		NA		99			414

Notes:

Italics - Data point excluded from 95% UTL calculation

NC - Not calculated due to an insufficient number of normally distributed data points

Q - Qualifier

QL - Quantitation Limit

Qualifier Notes:

NA - Not analyzed

U - Not detected at the given quantitation limit

J - Concentration is estimated

UJ - Not detected, quantitation limit is an estimate

R - Rejected

Figure 2-15 Location of Site and Regional Background Sampling Areas

